SCIENTIFIC AMERICAN

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TRANSMISSION OF POWER BY MEANS OF ELECTRICITY.

M. Marcel Deprez has sent to the Academy of Sciences the following official report of the committee of the Munich Electric Exhibition on the experiments made on and after the 26th September, 1882, concerning the transmission of power by dynamo electric machines:

"By means of two dynamo-electric machines (Gramme system) of identically similar make, M. Marcel Deprez has transmitted to Munich (over a distance of 57 kilometers) along an iron telegraph wire of 4·5 millimeters diameter the power obtained at Miesbach from a steam engine. The receiving machine placed in the Crystal Palace supplied motive power during eight days to a centrifugal pump feeding a small waterfall of about 2·5 meters in height. The dynamo-electric machines were set in motion for the first time on September 25, at 7 P.M., and according to the data of M. Datterer, an engineer appointed by the committee, the receiver placed at Munich rotated at a speed of 1,500 revolutions per minute; the brake used to measure the work was loaded with 1·5 kilogrammes.

"A series of accidents, due to the fact that the machines were made for laboratory experiments and not for practical work, put a stop, at the end of eight days, to the till then entirely satisfactory working of the machines. The hoops which surrounded the ring of one of the machines broke; owing to this, the wires of the ring, 0·4 millimeter in diameter, were injured and had to be reinsulated. In the small town far away from Miesbach these repairs could only be carried out under great difficulties, and necessitated much patience and perseverance on the part of M. Marcel Deprez's assistants.

"On October 9 and 10, when the Experiment Committee began to take measurements, a speed of only 1,600 revolutions per minute could be reached with the machine that had been repaired at Miesbach; the results obtained were, therefore, far less favorable than they would have been with the normal speed of 2,000 revolutions obtained at first. For some moments only during the measurements could the speed of 2,000 revolutions per minute be obtained, and, again, at the commencement of the experiments one of the brushes of the machine came off, which produced an extra current, and completely destroyed the machine.

"The results obtained under these unfavorable circumstances, under the direction of Professors Dorn, Kittler, Pfeiffer, and Schröter, were as follows:

	Ohms.
Resistance of the line.....	950·2
Resistance of the machine at Miesbach	453·1
Resistance of the machine at Munich...	453·4

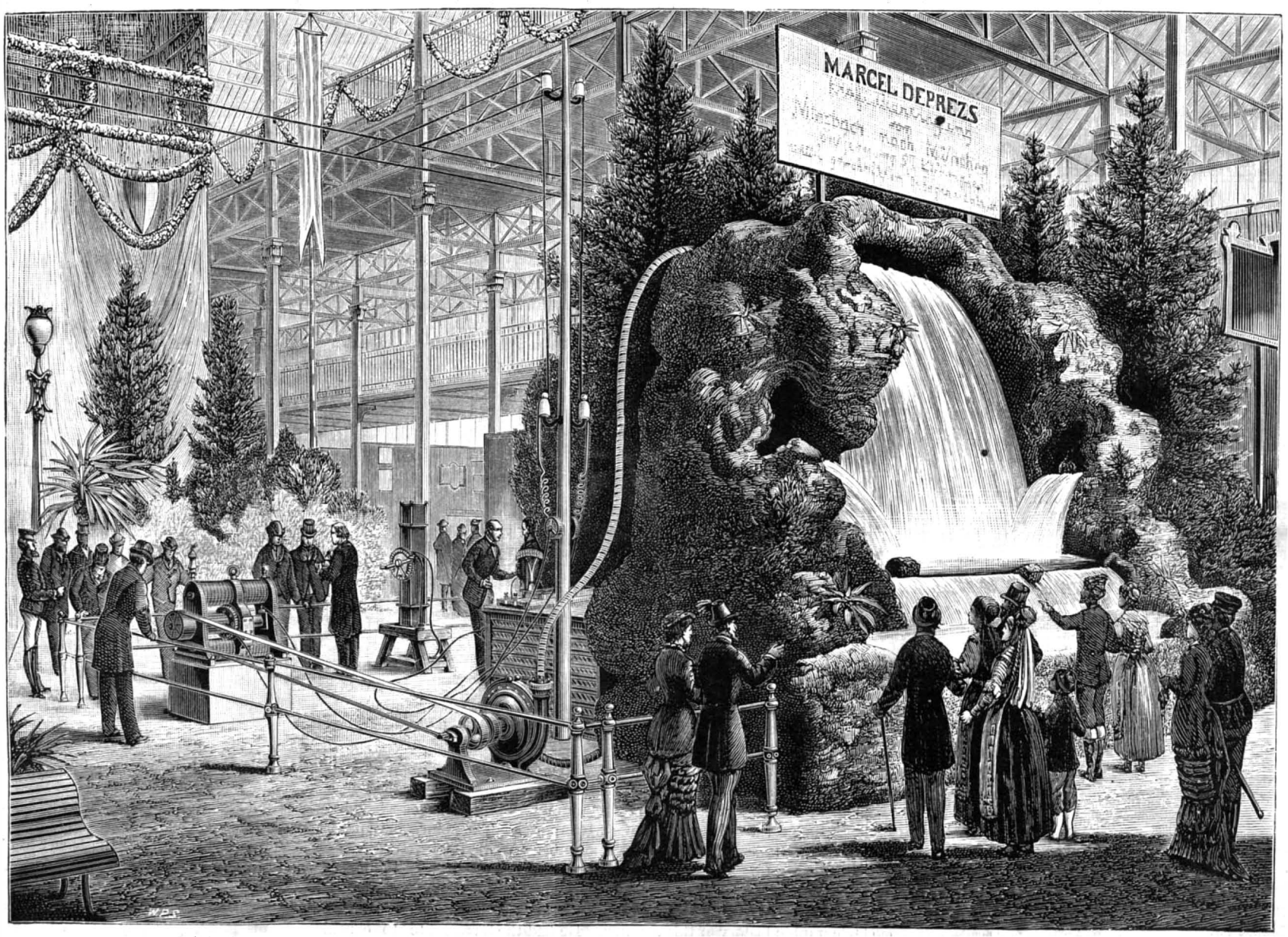
"The only experiment which need be mentioned lasted five minutes, on October 10, between 12:32 and 12:37. The number of revolutions per minute of the machines was at Miesbach 1,611, and at Munich 752; the current at Miesbach was 0·519 ampere, and the electromotive force at Munich 850 volts. Summing up and taking into account the length of the line, but not losses, we have at Miesbach an electromotive force of 1,343 volts, a total electrical work of 1·13 horse power, work equal to 0·680 horse power expended in the circuit in heating, and 0·433 horse power at disposal for the transmission of a power which is equal to 38·9 per cent of the total electrical work. The direct estimation of the effective work, undertaken at the same time as the electrical measurements, did not give any exact result; in the first place, the Munich machine had not a sufficiently solid foundation, and part of the work was absorbed by the vibrations of the machine; secondly, the Hefner-Alteneck dynamometer, used at Miesbach, was constructed to measure from 15 horse power upward, and the limits of error of this apparatus were too large for the small power required to be measured. The work obtained at the brake at Munich rose to 0·25 horse power; to this should be added the work absorbed by the vibrations of the machine. In the place of direct measurements a more exact value of the work expended at Miesbach will be arrived at by reckoning the electrical work expended at Miesbach and the return from the machine at Munich, which was identical with that at Miesbach, a return which can be estimated by the figures given above, taking into account the vibrations.

"As, owing to the numerous accidents indicated above, the results obtained during the measurements made by the Experiment Committee were much less favorable than those made during the first experiments, M. Marcel Deprez has decided to repeat the experiment at Munich, with more solidly made machines, and then only, we think, can a decisive judgment be given as to the return. Meanwhile, we do not hesitate to proclaim the success of the transmission of power from Miesbach to Munich as in every way an important event in the history of the technical applications of electricity."

We are indebted to *La Lumière Electrique* for our engraving, which represents the arrangement of the receiving apparatus as worked at the Munich Exhibition. For the above report we are indebted to the *Electrician*, which translates from *L'Electricien*.

The Mineral Industry in Spain.

According to statistics made for 1880, Bilbao is at the head of the iron ore exporting provinces of Spain. In 1880 the exportation was about 1,350,000 tons of ore; after this Murcia, Santander, and Almeria come, with about 375,000 tons. In the third place are Oviedo and Malaga, then Guipuzcoa, Huelva, and Navarra, and the last are Sevilla, Logrono, Badajoz, Pontevedra, Leon, Burgos, Teruel, Lugo, Guadalajara, Alicante, and Coruña. Huelva, Almeria, and Tarragona produce the principal quantities of manganese ore, Oviedo, Teruel, and Gerona take the second rank as producers of this mineral. Oviedo produces more than half of the coal of Spain. Cordova and Palencia produce only 75,000 tons; then Sevilla comes with about 25,000 tons, and then Leon, Gerona, Ciudad Real, and Burgos, with a great deal less. In 1880, 2,597 mines, ninety-three fields, and two escorials were explored, which is ninety-three fields and two escorials more than in 1879. The number of workmen employed was 52,495 men, 1,222 women, and 6,188 boys. The number of steam engines used was 372, with 8,893 horse power, which shows an increase of fifty-eight engines, with 1,632 horse power, as compared with 1879. The production of iron ore of 1880 compared with 1879 shows an increase of 905,000 tons; that of manganese ore, 208 tons; that of coal, 80,000 tons.



DEPREZ'S EXPERIMENT ON THE TRANSMISSION OF POWER FROM A DISTANCE BY ELECTRICITY.

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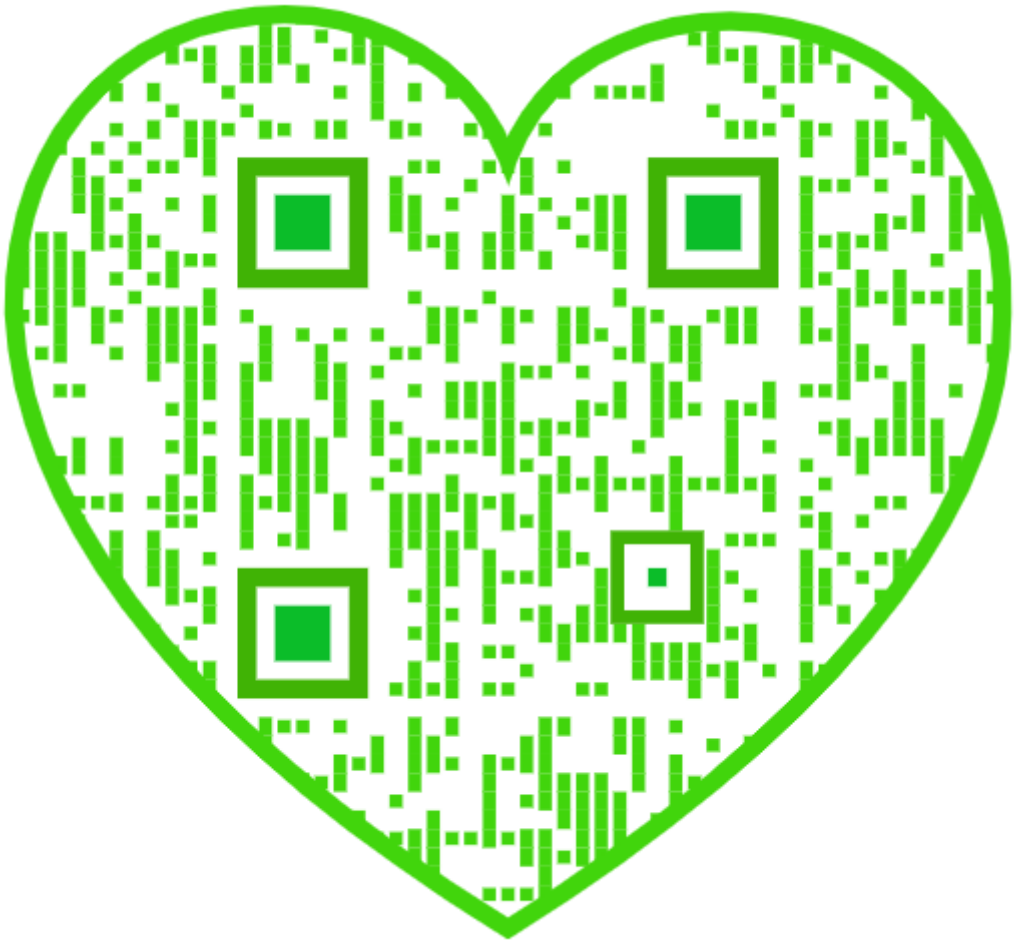

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PETER COOPER.

In the death of Peter Cooper New York loses a most valued citizen, whose noble life endeared him to every inhabitant almost as a personal friend. He was to this city what Benjamin Franklin was to Philadelphia; and there were various points of similarity in the general characteristics of these illustrious men.

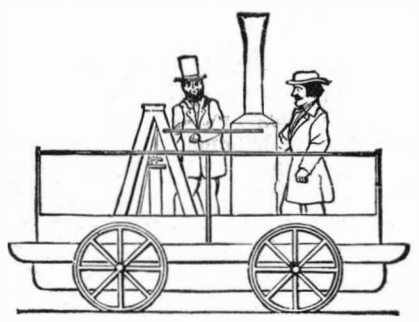
Peter Cooper was born on the 12th of February, 1791, in the city of New York, and died on the 4th of April, 1883, at his residence, No. 9 Lexington Avenue, in the 93d year of his age. He was a man of exemplary habits of life, to which is due, doubtless, the prolongation of his years. At the age of seventeen he was apprenticed to the business of coach making, for which, it is said, he received $25 a year. After that he worked for $1.50 a day at the business of making machines for shearing cloth. Having saved money enough to buy a right in the patent to manufacture these machines, he went into business on his own account, and was patronized by Mr. Vassar, the founder of Vassar College. From him Mr. Cooper received at one time $500 for machines that he had made, and this may be said to be the principal capital, financially, on which his subsequent operations were based. From an early age he developed a great taste for mechanics, and was constantly inventing something new. When a lad he made a machine to utilize the power of the rising and falling tides. In early life he was led into the purchase of a glue factory in this city, which he carried on with such success that in due time Cooper's name for supplying the best article of glue to be had in the market became quite widely known, and the business grew into one of great importance.

Another portion of his attention was directed to the manufacture of iron. He built a rolling mill and iron furnaces in Baltimore, and from these sprang several very large iron rolling establishments in different parts of the country. He was among the first to roll iron girders for fireproof buildings.

Many years ago he devised a method for propelling canal-boats by a series of endless chains laid in the water on the bottom of the canal. This method has since been brought into use, and is known as the Belgium system. He devised a method of transporting coal from the mines to his furnaces by means of traveling wires and buckets. This system has also come into very extensive use. In 1824 or 1825 he designed a torpedo boat, which was moved by a screw propeller guided by steel wires which were unwound from a reel.

Peter Cooper's name is associated with the early railway history of this country in a curious manner. He built the first locomotive ever made in this country, and he was the first to draw passenger cars by steam. The earliest locomotive operated in this country was an imported machine from England, called the "Stourbridge Lion." It was tried at Honesdale, Pa., on the road of the Delaware and Hudson Canal Co., August 8, 1829, Horatio Allen being the engineer who worked the locomotive. The English engines, owing to long wheel base, were not well adapted to turn short curves, such as had been built on the Baltimore and Ohio road—then a horse railroad.

Peter Cooper at this period owned some land in Baltimore, the enhanced value of which depended on the successful operation of the Baltimore and Ohio road; and, to demonstrate that a locomotive could be built which would run on the short curves of that road, Mr. Cooper, in 1829, built the "Tom Thumb," shown in our cut. This engine had an upright boiler 20 inches diameter by 5 feet high fitted with gun barrels for flues. It had a single cylinder 3¼ × 14¼ inches. The engine drove a large gear which meshed into another smaller gear on the axle. The fire was urged by a fan driven by a belt. The driving wheels were 2½ feet in diameter. On the 28th of August, 1830, the first railroad car in America propelled by a locomotive was tested on the Baltimore and Ohio road. The wheels



PETER COOPER'S LOCOMOTIVE, 1829.

were "coned," and this was the first use of this principle as applied to car wheels, and was suggested by Mr. Knight, chief engineer of the road.

This engine (Cooper's) was coupled to a car in front of it containing a load of 4½ tons, including 24 passengers. The trip of 13 miles was made in 1 hour and 15 minutes, the best time for a single mile being 3¼ minutes. The return trip of 13 miles was made in 57 minutes. While this engine of Mr. Cooper's was built for experiment solely, it was the first locomotive built in America.

Mr. Cooper's name is also prominently associated with the telegraphic history of this country. He had the foresight to discern the extraordinary importance of the electric telegraph to business and to all the concerns of life when but few could see it. He boldly advanced large sums in the establishment of telegraphic lines in the infancy of the business, when it was very difficult to find capitalists with sufficient confidence to take the risk. He was President of the North American Telegraph Company when it controlled more than half the lines in the country; as President of the New York, Newfoundland, and London Telegraph Company, he was associated with Marshal O. Roberts, Moses Taylor, Wilson G. Hunt, Cyrus W. Field, and others. They steadily paid out money for fourteen years, without return, in the confident hope of ultimately perfecting telegraphic communication between Europe and the United States. Peter Cooper was strong and ardent in his support of the enterprise, which was finally crowned with brilliant success.

One of the most prominent of the various benevolent enterprises with which Peter Cooper's name is associated is the institution known as the Cooper Union for the Advancement of Science and Art. The building occupies the whole of the small square at the junction of Fourth Avenue, Eighth Street, and Third Avenue. Mr. Cooper's avowed object in making this munificent gift was to supply to the industrious poor of New York what he had felt the need of himself—the opportunity for instruction in the industrial arts free of cost. He had attended school only half of each day in a single year, and he knew all the disadvantages under which the children of the poor are placed when they are kept out of school to assist in the support of the family by their labor. His plan, therefore, was to have an institution where most of the teaching should be done at night. He began the work when he was over sixty-four years old, and he lived to see many thousands of people filled with gratitude for his philanthropic efforts in their behalf. These efforts cost him about a million and a half of dollars. He was not unfamiliar with the educational needs of the city. He early became a trustee of the Public School Society, and was its Vice-President when it was merged in the Board of Education. He was subsequently a School Commissioner, and saw how often the promising children of the poor were launched into active life without the preparation which would enable them to use their powers to advantage.

The cost of the building was $630,000. The total cost of building and education has been about $2,000,000. The work accomplished by this institution is comprehensive. It comprises regular courses of instruction at night, free to all who choose to attend, on social and political science, on the application of science to the useful occupations of life, and on such other branches of knowledge as will tend to improve and elevate the working classes. It includes, also, a school of design for females, which is now attended by over 300 pupils, a free reading room and library, galleries of art, collections of models of inventions, and a polytechnic school. The evening schools are attended by thousands of young men, who are mostly mechanics. They study engineering, mining, metallurgy, analytic and synthetic chemistry, architecture, drawing, and practical building. The institution includes a school of art for women, a school of wood engraving, and a school of photography, all of which are free. There are thirty instructors employed. During the past year 3,334 pupils passed through the different classes, many of whom came to New York from distant parts of the United States for the purpose of attending the institution. The expenses of keeping up all the departments last year were $50,973.

MOSQUITOES VS. MALARIA.

In a paper read before the Philosophical Society of Washington, Feb. 10, 1883, Dr. A. F. A. King endeavored to sustain the thesis that malarial disease is produced by the bites of insects inoculating the body with malarial poison, the mosquito being considered in this country the most active agent.

Whatever value may be ascribed to mosquito bites as a cause of disease (and there are several very strong and, to our mind, fatal objections to the theory, and especially the fact that malaria prevails at seasons when no mosquitoes occur), it is interesting to observe how the properties and phenomena usually ascribed to malarial vapors become susceptible of explanation on the above insect theory, and how easily coincidences are made out. In the course of his remarks he presented the following series of twenty statements culled from leading medical authorities, in relation to malaria, and which, he maintained, are explicable on the mosquito theory.

1st. Malaria affects by preference low and moist localities. Such localities are the natural abode of mosquitoes.

2d. Malaria is seldom developed at a lower temperature than 60° F.; neither are mosquitoes.

3d. The active agency of malaria is checked by a temperature of 32° F. The same may be said of the mosquito.

4th. Malaria is most abundant and most virulent as we approach the equator and the seacoast. So, under specified conditions, are mosquitoes.

5th. Malaria has an affinity for dense foliage, which has the power of accumulating it, when lying in the course of winds blowing from malarious localities. Trees accumulate mosquitoes in the same manner.

6th. Forests and even woods have the power of obstructing malaria and of preventing its transmission under these circumstanees. So of mosquitoes.

7th. By atmospheric currents, malaria may be transported to considerable distances, probably as far as five miles. Mosquitoes also.

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8th. Malaria may be developed in previously healthy places by turning up the soil, as in making excavations for the foundations of houses, tracks for railroads and beds for canals. Such excavations when containing stagnant water may also serve as mosquito nurseries.

9th. In certain localities malaria seems to be attracted and absorbed by bodies of water lying in the course of such winds as waft it from miasmatic source. Such bodies of water may also arrest the passage of the mosquito, under certain circumstances, as in the absence of a strong wind to waft them over.

10th. Experience alone enables us to determine the presence or absence of malaria in any given locality. Conversely, the absence of the mosquito, it was claimed by Dr. King, appeared to prevent malarial disease.

11th. In proportion as countries previously malarious are cleared up and thickly settled, periodical fevers disappear. The consequent better drainage, disappearance of underbrush, and the more free play of fly catching birds may also contribute to lessen mosquitoes.

12th. Malaria usually keeps near the surface of the earth; it is said to "hug the ground." The same is true of mosquitoes.

13th. Malaria is most dangerous when the sun is down, and seems to be almost inert during the day. The mosquito is active at night; at rest by day.

14th. The danger of exposure to malaria after sunset is greatly increased by the person exposed sleeping in the night air. Persons while awake brush away mosquitoes; those asleep submit to being bitten.

15th. Of all human races the white is most sensitive to marsh fevers, and the black least so. The black man is less easily seen by the mosquito, and the odor and greasiness of his cutaneous secretions are assumed to be offensive to the insects.

16th. In malarial districts the use of fire, both indoors and to those who sleep out, affords a comparative security against malarial disease. Mosquitoes, attracted by the light, fly into fires and lamps at the cost of life.

17th. The air of cities in some way renders the malarial poison innocuous, for though a malarial disease may be raging outside, it does not penetrate far into the interior. Mosquitoes also, during their nocturnal flight, will be arrested by the houses, fences, lamps, and fires of the suburbs, so as to be prevented from penetrating far into the interior of cities.

18th. Malarial diseases are most prevalent toward the latter part of the summer, and in the autumn. Mosquitoes are more plentiful during those seasons.

19th. Malaria is arrested not only by trees, but by walls, fences, hills, rows of houses, canvas curtains, gauze veils, mosquito nets, etc. So are mosquitoes.

20th. Malaria spares no age, but it affects infants much less frequently than adults. Infants, however, from the care with which they are housed and covered with gauze to keep off house flies, and also shielded from mosquito bites.

C. V. R.

THE EXTERMINATION OF VENOMOUS SERPENTS.

The appalling destruction of life by snake bite in India has for many years caused the minds of learned and ingenious men to be exercised in quest of some remedy which shall effectually cope with so terrible an evil. That their efforts have hitherto been directed rather toward discovering an antidote for the venom than to what is proverbially better than cure, viz., prevention, or, in other words, the extermination of the reptiles themselves, is not to be wondered at when collateral circumstances are taken into account—the exuberance of vegetation and smaller forms of animal life which afford the creatures shelter and sustenance, even in the immediate vicinity of human habitations; the intense susceptibility of the natives, both to the accident of the bite and its fatality, from various causes; their religious prejudices, which, at the outset, greatly hamper the success of Government rewards for the slaughter of certain species, as proposed by Sir Joseph Fayrer; and the fact that the multiplicity of venoms as well as species has only recently been recognized. The dense population, tolerance if not encouragement of the cobra, the habit of walking barefoot and consequent liability to be bitten on the ankle (the most dangerous situation in the body, owing to the large size and superficial position of the veins in that region), the low *physique* and apathy of the Hindoo, which cause him to lie down and die or trust to "charms" instead of resorting to prompt and vigorous measures—all these and many other conditions contribute their influence in keeping up the enormous death rate in India. As to the serpents themselves, many western species, especially among the *Crotalidæ*, are to the full as deadly as the krait, cobra, or daboia.

In a recent number of the SCIENTIFIC AMERICAN, it was suggested that the snakes might be lured to their own destruction by means of traps or the bait of poisoned food; or that some snare might be devised wherein they could be captured alive and so handed over to the authorities for killing by those castes whose tenets do not permit them to practice serpenticide. With regard to the first two proposals, it is to be feared that they offer little prospect of success. When we consider the character of their natural haunts—dense jungle or the crevices of rocks—and the difficulty of setting traps there, their uncertain rovings, and the special reasons which militate against the ordinary mechanical principles of such instruments (as the great distribution of their bodily weight, peculiarity of movement, and possibility of egress as well as ingress through small apertures), it will be seen that a specimen secured in this way would be as great a curiosity as the occasional sea gull which is reported as being caught by an oyster. Mr. Frank Buckland, however, has put on record a story which he heard about a cobra de capello being drawn from underneath the flooring of a bungalow by a fish hook and line, baited with a small frog.

Any scheme involving the administration of poison is even less hopeful, seeing that they can rarely, if ever, be persuaded to take any but living food. In the very doubtful event of some powerful drug thrown into a pond to which they are known to resort proving fatal to them, for every snake so destroyed there would be hundreds of other animals scattered around. Not only would it be next to impossible to get them to swallow poison, but they are extremely tolerant of its action when it is taken. Some time ago the writer wished to kill a captive rattlesnake (*Crotalus horridus*) by this method, and with that intent poured two drachms of Scheele's prussic acid down its throat. Scheele's preparation contains four per cent of the anhydrous gas, and the quantity was sufficient to kill at least twelve men in a few seconds. On the reptile it produced no apparent result whatever; the box, small and compactly made of thick wood with a tightly fitting slide, was closed directly the dose was swallowed, so that the occupant had the full benefit of the intensely sedative fumes. Four drachms more only served to make it a trifle dull and lethargic, and an ounce of chloroform in addition was given before it succumbed. I should mention that this rattlesnake was rather cold and torpid at the time, in which state it would be less receptive of toxæmic influences.

Possibly a pitfall of some sort would be the most likely institution to diminish the number of serpents in its neighborhood appreciably. A friend of mine, living in Brazil, had a large disused cistern near his house. The masonry was cracked, and allowed the water to leak away, but sufficient moisture remained at one end to provide for a colony of frogs and to form a drinking trough for birds and small beasts. Into this tank snakes often found their way, perhaps attracted by the prospect of food, perhaps simply overbalancing themselves at the edge, and were unable to scale the smooth plastered walls and make their escape. One morning between twenty and thirty little new-born jararacas (*Craspedocephalus atrox*)—a most venomous species—were discovered in the prison. The mother must have been a huge specimen, for she had taken advantage of an inequality of surface high up on the side of the cistern to aid her in getting out. Now, a structure of this kind sunk below the level of the ground in an infested district, and furnished with water, frogs, and a cage of rats, or some such small deer—necessarily protected by a cage to preserve them from other than ophidian marauders—might usefully co-operate with the active endeavors of the Government snake hunters, whose establishment is proposed, and who would visit the inclosure daily and add its nocturnal harvest to their spoils. This, again, would meet the views of those sects who are prohibited from killing; but it should be noted that the mild Hindoo is already fully alive to the desirability of reaping the proffered annas without prejudice to his spiritual welfare, and hatches all the snakes' eggs he can find by means of artificial warmth in earthen pots, feeding the young ones until they are big enough to earn the tariff reward.

For every one that may be expected to find its way into a trap, however arranged, a dozen might certainly be taken, living or dead, by those who would make a business of pursuit; and for capturing them alive there is no safer or better appliance than the "twitch." This consists of a simple loop of string passed through an eye at the end of a long crooked stick, and controlled by the hand. Directly a snake is seen it is hooked out into the open, if need be, away from all shelter, the noose dropped over its head and drawn up tight, and in that way it can be carried, powerless to do harm, or deposited in any receptacle which is ready for it. Collectors, too, would find this little apparatus far more practicable than the net or tongs. Places likely to form a resort for the deposition of eggs—situations which combine warmth, moisture, and protection, as a rule—should be diligently explored; and rocks or other fastnesses known to be their favorite breeding grounds should, if possible, be frequently disturbed by blasting. Catlin relates that near Wilkesbarre, in Pennsylvania, there was a cavern in the mountains inaccessible to man known as Rattlesnake Den by reason of the enormous numbers of those reptiles which made it their abode. To such an extent did they swarm in that locality that, although five or six hundred would sometimes be slain in a day by the expeditions organized for the purpose, in which the author took part, the bulk of the Crotaline settlers always managed to reach their lair in safety. On one of these *battue* days a happy thought struck Catlin. He had caught a rattlesnake uninjured, and while one of his companions pressed its head to the ground with a stick, he tied his powder-flask to the creature's tail and attached a slow match thereto. As soon as it was released the serpent immediately sped away to the cavern, dragging the flask behind it. A tremendous explosion presently followed, and death reigned triumphant in Rattlesnake Den.

In all probability, the acclimation or encouragement of certain animals which seek out snakes as their favorite food will do more toward effecting their extermination than anything else. The mongoose enjoys a reputed pre-eminence in this respect which is quite undeserved—it need hardly be said that the "antipathy" which it is supposed to entertain toward its prey is a chimera born of an argument by analogy to human prejudices. The ichneumon hunts snakes to eat them; so do various foxes, tayras, rats, civets, grisons, weasles, genets, paradoxures, and other members of the *Viverridæ* and *Mustelidæ*. Still more addicted to an ophidian diet are pigs; it is said that Mauritius was cleared of venomous species by a number of wild hogs turned loose there. Toads, frogs, fish, lizards, newts, and even slow worms devour young snakes; indeed, it is only their popularity as an article of food that serves to restrain their increase, for they are produced in broods of from twenty to a hundred or more. But their greatest enemies are birds. Peacocks, in particular, will desert the home where they are fed in a district abounding with snakes; not long ago, six pairs of pea fowl were employed to get rid of the vipers on an island off the west coast of Scotland, which they rendered almost uninhabitable by their abundance. Storks, pelicans, cassowaries, sunbitterns, cranes, falcons, and some vultures are also perpetually on the lookout for snakes, while the scientific title of the secretary bird, *Serpentarius reptilivorus*, sufficiently indicates its proclivities.

ARTHUR STRADLING, C.M.Z.S.

Watford, Herts, Eng.

Running as an Exercise.

Among the means which nature has bestowed on animals in general for the preservation and enjoyment of life, running, says Mercurialis, is the most important. Since, then, it is pointed out to us by nature, it must be in a high degree innocent. It is very singular that we should apparently do all we can—which, fortunately, is not much—to make our children unlearn the art of running. Our earliest physical treatment of them seems calculated to destroy their aptitude for it; in a little time, it is too often the case that the city boy scarcely dares look as if he wished to run, we prohibit it so strongly as vulgar, and when he is more grown up gentility steps in and prohibits it altogether. Medical prejudices and our own convenience contribute likewise their share, and never allow our children, boys and girls, to acquire an art innocent of itself and necessary to all. It is possible that a person may get injury from running, but the fault is not in the exercise, but in the person who runs without having had proper training and practice.

Negroes and Indians in a state of nature run daily in pursuit of game for food with a facility at which we are astonished, but they are not more liable to consumption on this account than those beasts that are so famed for swiftness. The body of no animal seems better adapted to running than man's. The nobler parts, which might be injured by an immoderate reflux of blood, are uppermost, and the laws of gravitation assist in propelling the runner forward. He has little to do but to strengthen his limbs by practice and concentrate his mind on the effort, and there is nothing severe in this, as experience has shown. Indeed, running may be made very beneficial to the lungs, and perhaps there is nothing better calculated to strengthen these organs, in those who are shortwinded, than gradual, careful training in this almost lost art. "As soon as children are expert in walking, turning, and the like," says the sagacious Frank, "running races under proper precautions is an excellent exercise for them." The principal objects of this exercise are to strengthen the limbs, develop the lungs, exercise the will, and promote the circulation of the blood.

Running was so highly esteemed by the old Greeks, that Homer observed that no man could acquire greater fame than by being strong in his hands, feet, and limbs; Plato recommends running, not only to boys and girls, but to men; Seneca, who expresses strong disapprobation of athletics, recommends running to Lucilius for exercise. The following rules may be observed:

Running should only be practiced in cool weather; as, for instance, in the late fall, winter, and early spring months.

The clothing should be light, the head bare, and the neck uncovered. As soon as the exercise is finished, warm clothing should be put on and gentle exercise continued for some time. It is not necessary to have a race course. The teacher of a school may take his pupils into the fields and find suitable ground for them. Then his pupils may exercise their bodies in other ways, acquire strength, agility, health, and the capacity of continued exertion; the will is brought into play vigorously, which is a great aid in the battle of life.

Care must be taken not to overdo, and thus, perhaps for life, weaken or injure the heart. The race, at first, should be short and frequently repeated, rather than long, and full speed should not be attempted for some time.

Running is well adapted to young and middle aged persons, but not to those who are fat. Sedentary persons may find great benefit in it after the day's work is ended. If they live in cities, a quiet spot in the park may be selected, and short trials adapted to the strength entered into. Invalids may do the same thing, only they must be more careful than the robust never to over-exert themselves.

Girls may run as well as boys, and, while they cannot go so fast, they can race much more gracefully and beautifully. Indeed, there can be few more attractive sights than that of a race between beautiful girls from ten to twelve years of age. After puberty, the change in the formation of the bones of the pelvis in girls renders running less easy and graceful. In ancient Greece girls were trained to run races as well as boys, and to their superb physical culture was in great part due the grandeur and beauty of Greek life during the years of their ascendency. The modern style of dress for girls after puberty is also entirely unsuited to running.—*Herald of Health.*

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Tumefaction of Starches.

Some time since, Mr. W. H. Symons exhibited at the Royal Microscopical Society a hot and cold stage for the microscope, by means of which the exact temperature at which different starch cells swell or tumefy could be observed. By means of this instrument this observer determined the tumefaction point of a number of different starches, and as some of them are largely used by brewers, we give his results:

Starch.	A few swollen.	Majority swollen.	All swollen.
Potato	55° C.	60° C.	65° C.
Sago	64° C.	68° C.	74° C.
Bermuda arrowroot	62° C.	69° C.	73° C.
Wheat	60° C.	65° C.	70° C.
Maize	65° C.	70° C.	77° C.
Oat	65° C.	70° C.	77° C.
Rice	70° C.	75° C.	80° C.

It will be observed that, as a rule, the largest starch cells tumefy at the lowest temperature; and in accordance with this, rice requires the highest temperature of all the starches experimented on for the complete tumefaction of its cells. It was further proved by Mr. Symons that prolonged exposure to a temperature a little below that of tumefaction not only does not tumefy the granules, but enables them to bear a slightly higher temperature than they otherwise would do. When starch granules are gradually heated, the majority do not burst their integument by splitting it from the nucleus in all directions, as when they are subjected to a sudden rise of temperature, but a small bladder-like process is thrown out near the nucleus; and if the temperature be kept constant the swelling increases, although still confined to that portion of the granule, bursts, the granulose oozing out, and if sufficient time be allowed, the integument, still retaining the original size and shape of the truncated granule, is all that is left.

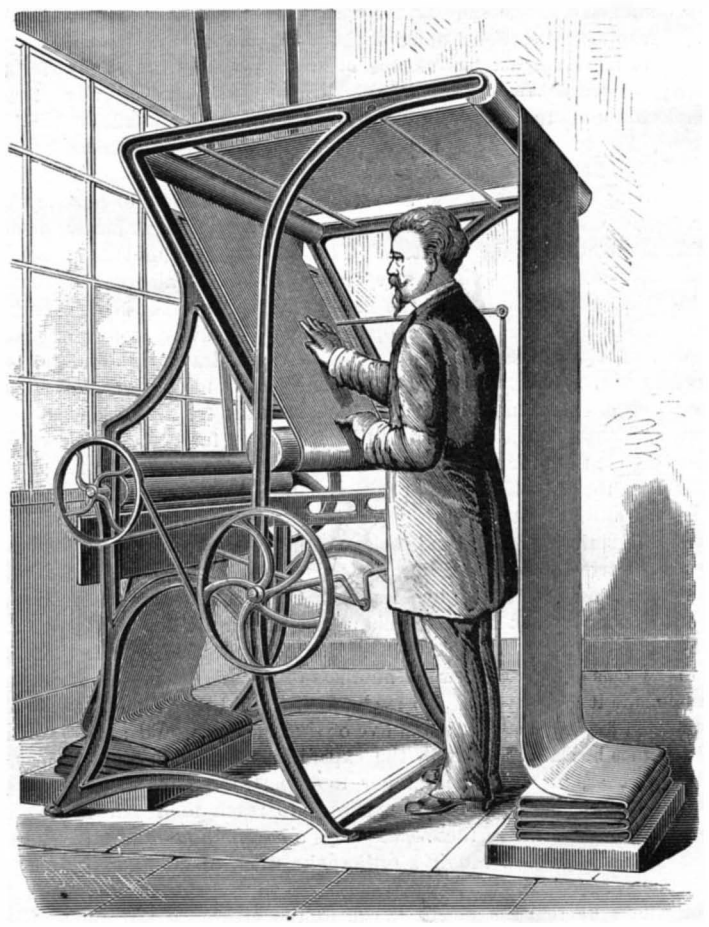
MACHINE FOR EXAMINING GOODS.

One of the most important duties in a mill or warehouse is that of examining the goods made or bought. With the best of machines and the most careful workmen faults and defects may occur, but, considering that all machines are not always perfect, and that all work people are at best only human, we must be prepared to find in every class of goods faulty parts. To detect this, to put the faulty pieces aside in order to draw the attention of the delinquent to them, and, if necessary, to fine him or her, and also to mark the goods as damaged and indicate a certain allowance on them —these are functions which ought to be intrusted to vigilant persons, and the task of examining the goods ought to be made as easy as possible.

In most cases the cloth is laid upon a table before a window, and layer after layer turned over by hand, which is not only a tiring but also a tedious proceeding, and, on that account, liable to be done sometimes inefficiently. We have, therefore, in many places seen a roller affixed to the ceiling of the room, and the cloth drawn over it by hand; this, when done before or behind a window, as the goods may require, shows all faults of weaving, but not always those of dyeing. A foreign machine maker has carried this arrangement a little further, and constructed a machine for the purpose, which is driven by a strap, so that the examiner has only to attend to his duty, and, his hands being free, can mark the cloth or brush it up, or otherwise attend to it more closely.

The construction of the machine will be easily understood; it is shown as placed before a window; the cloth is laid before it on a board, then passes upward through a couple of drag rollers, over a guide roller, and then in front and over a strong sheet of plate glass, and then over a pair of upper rollers down to the floor behind the examiner. The latter thus sees through the cloth as it passes the glass plate, and is able to detect all faults and blemishes of weaving; by means of a treadle he can put a brake on and stop the course of the cloth any moment, for the purpose of marking a faulty place or other reason, and his work being thus performed without bodily exertion, can be more thoroughly relied upon.

In our illustration the machine is shown driven by a strap, which is the most convenient arrangement in a mill; but as much of the work of examining goods is performed in warehouses, the machine is also made to be turned by a treadle, which the examiner has, in that case, to work by his foot, and thus can also stop the machine when required.—*The Textile Manufacturer.*



MACHINE FOR EXAMINING GOODS.

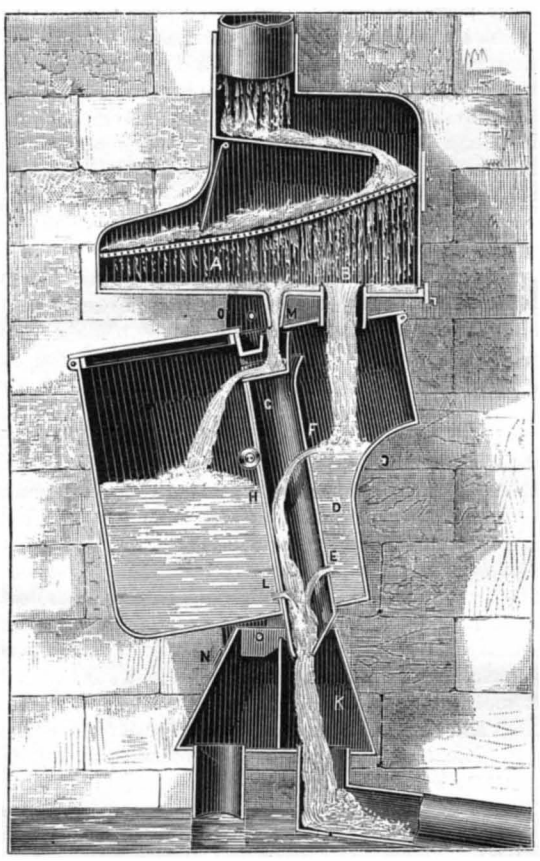
Heating by Acetate of Soda.

The heating of small pits and greenhouses is, in spite of the numberless apparatus in use, a source of trouble. To such folk—and their number is legion—the new plan of heating by acetate of soda seems as if it might be developed into something serviceable. According to an article in *Nature*, the plan is largely adopted on the London and North Western Railway for foot warmers.

The duration of heat in a warming pan with acetate of soda is claimed to be four times that of hot water alone. This is due to the amount of heat required in the first instance to change the acetate of soda from a solid to a liquid state, which heat is liberated as the acetate gradually resumes the solid form. It is stated that only about half the heat is required to produce the same effect as in the case of hot water. The acetate does not require to be renewed except at long intervals. To restore the heat in the pans after cooling, they have simply to be plunged in boiling water for half an hour.

ROBERT'S AUTOMATIC RAIN WATER SEPARATOR.

In a goodly number of countries where water is scarce the precaution is taken to collect rain water in cisterns, whence it is drawn in measure as it may be needed. In



ROBERT'S AUTOMATIC RAIN WATER SEPARATOR.

certain slightly favored countries such water constitutes nearly the sole resource of the inhabitants. It will be understood, then, how important it is to collect it, and especially to preserve it. The first and greatest precaution to be taken is to admit into the storage reservoir only the second water, for the time which elapses between successive showers allows the roofs and other surfaces that collect the water to become dirty and thus foul the first water that falls. And such water, if care be not taken to lead it into the drain, will dirty and pollute the entire quantity stirred up.

The Robert separator is designed to overcome the above named annoyance automatically and regularly. It prevents the first rain water that has washed the roofs and gutters, from entering the cistern, and leads it into a special reservoir or carries it to the drain.

The annexed figure will permit the very simple arrangement of the apparatus and its mode of operation to be readily understood. It is situated at the base of the leader, and its dimensions vary with the superficies of the roof to be drained. It includes a stationary and a movable part. The former of these, which is connected with the bottom of the leader, carries a movable perforated disk for arresting the solid particles, and an outlet, B, at the lower part. The separator, which is movable around a horizontal axis, is seen at C, and is divided into small compartments, D, into which falls the first rain water. E is an orifice proportioned to the surface of the roof, F is a wider orifice to permit the flow of water during ordinary rains, and G is a discharge pipe. During heavy rains the water fills the compartment, D, and bows over the upper orifice of the discharge pipe. H is a small orifice in the partition behind the pipe, G. When the entire amount of water that has fallen is unable to flow through E, it rises in the compartment, D, and, passing through the orifice, H, slowly fills the compartment, I. The apparatus is then inclined as shown in the figure, and the clean water changes its direction, passes through K, and enters the cistern. L is a small aperture near the bottom of the compartment, I, which permits the latter to empty, and M is a pipe through which flow the last drops of water when the rain ceases. N is a hook which prevents the separator from swinging and permits the whole of the water being sent to the drain when, for any reason whatever (a repair of the cistern, for example), it is desired to admit no more rain water.

When the apparatus is empty and the water begins to fall the latter is sent to the drain; but, as soon as the water increases, and the time has elapsed necessary to wash the roof, it flows through H, fills the compartment, I, and tilts the apparatus, and then begins to flow through K to the cistern. When the rain ceases, the compartments empty and the apparatus tilts anew to prepare itself to send to the drain the first water of the next shower, and so on. Everything is arranged, then, so that the cistern shall receive only clean water which has been freed from every kind of impurity that fouls the roof.—*La Nature.*

Test for Ammonia.

A sensitive test for gaseous ammonia is proposed by Gustave Kroupa. He dissolves magenta in water, and gradually adds dilute sulphuric acid, until the yellowish color passes into a yellowish-brown. Unsized paper is saturated with this solution, and then assumes a yellowish color, becoming crimson on exposure to the vapor of ammonia. This test is declared to be exceedingly sensitive, and as simple and easy to prepare as turmeric paper. The magenta test papers must be preserved from contact with the air, in closely-stoppered bottles; and it is not stated whether the test must be made wet or dry, or what minimum proportion of ammonia will be detected thereby, in order that it might be seen whether the new test possesses any advantages in this respect on the universally used turmeric test.

Examining Trainmen for Promotion.

A Jersey City paper gives the following account of the way promotions are made on the New York Division of the Pennsylvania Railroad: For the past three weeks twenty-nine brakemen and baggage masters on the Pennsylvania Railroad have been attending school in the reading room of the Jersey City depot. In anticipation of a big passenger business the coming spring and summer, the company has thought fit to supply itself with more conductors. Capt. Osborn, the ticket receiver at Jersey City, who has the railroad ticket business at his finger's end, is instructing the class of twenty-nine men. He shows the men the privileges accorded the different classes of tickets, and how to act when a passenger tenders a ticket which is worthless for passage.

Captain Osborn will soon begin to examine the twenty-nine men. This will take two weeks at least. A number of the men have been brakemen for ten or twelve years.

After each one in the class has undergone a rigid examination, Captain Osborn will recommend about ten of those who pass the best examination. The names he selects will be referred to Mr. Pettit, the superintendent. These men will then be sent to the general office of the company, on Fourth Street, where they will be subjected to another examination of a week's duration, which will be conducted by an examining board appointed by Max Riebenack, the general auditor of passenger receipts. This is the final examination, which decides the fate of the aspirant in the ticket technicalities of the position. After this the candidates for conductorships who have passed at the Fourth Street office go back to Jersey City, where Mr. Adams, the trainmaster, takes them in hand, and finds out what they know about transportation, how they would act to prevent accident, and what they would do in case of a smash up. If they pass in this branch, then they receive their commissions as conductors. As there are hundreds of different kinds of tickets, whose privileges and value are of several conditions, and the knowledge required of the aspirant as to transportation is very intricate, a man has to have a good head to get through. He must be possessed of natural intelligence, and must have acquired a vast amount of experience before he can hope to be made a conductor.

AN International Exhibition will be opened at Calcutta next December. Two thousand square feet of space have been reserved for American exhibitors.

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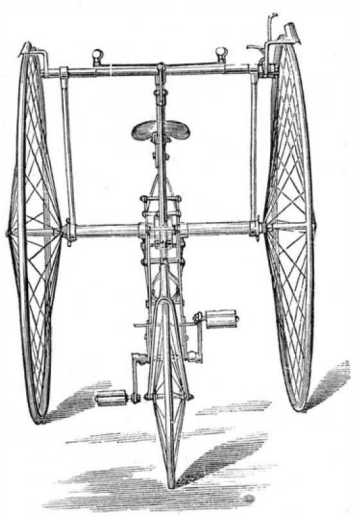
Heat and Magnetism.

L. Pilleux has lately called attention to the heating of iron during its magnetization. The fact had been previously observed by D. Tommasi in some researches, which are not yet published, upon the comparative study of the chemical properties of ordinary iron and of magnetized iron. In order to obtain a constant magnetic intensity, he employed an electromagnet of a single branch in place of an ordinary magnet. When the current, even if it was produced by a weak battery, had traversed the coil for some hours, the magnetized bar became perceptibly warm. He at first attributed the heating of the iron to the heating of the coil; but he was greatly astonished, one day, when he had removed the bar in order to clean it and had forgotten to interrupt the current, to find that the coil was not heated at all.—*Les Mondes.*

IMPROVED TRICYCLES.

In the "Leicester Safety" tricycle the rider is placed upon a saddle vertically above the pedals, and can therefore



THE "LEICESTER SAFETY" TRICYCLE.

employ the effectual downward thrust so approved of by the medical profession. He has before him a safety bar upon which he may rest his hands, from which he may steer and apply the brakes, and which also serves to prevent his falling forward when moving down hill. The tricycle is a front steerer, which adds still more to its safety in the descent of hills. The gearing has the advantages of backward and forward double driving combined in one central endless chain passing from the pedal crank to the axle. Steering is effected by the front wheel, which, from the construction of the entire machine, must always have a large percentage of the rider's weight pressing upon it to insure its efficacy. Behind the rider, to prevent all possibility of a fall backward, is a bar or tail, which adds also to safety in mounting and dismounting. The brakes act upon the tires of the driving wheels by a movement of the wrists, the right or left being applied as desired, or both together, while the steering can be effected at the same time, and without moving either hand from the safety bar.

In order to provide a tricycle for use in India and other countries where native labor is abundant, and the climate such that a European finds all outdoor exercise impossible, a tricycle has been devised to be propelled by cooly power, which our engraving clearly shows. The brake is applied to a drum on the gearing box. The standard size of the driving wheels is 48 inches, and these can be geared either level or slightly down; for hilly countries the latter is recommended. It is made single to seat one European, driven by one cooly, or in a double form to seat two Europeans, propelled by two coolies. The native driver sits behind, pedaling and steering the machine, which becomes, as a matter of fact, a cheap kind of carriage, requiring no horses, and no stabling or coach house.

A Place where They Have no Flies.

A correspondent of *Science* says: I remember, years ago, seeing a dried specimen of the house fly sent to Boston in a letter, as a great rarity there—the only one the sender had seen in a year's residence in Manila. As this is one of the constant accompaniments of man, and a sure sign of his presence or vicinity, I was at a loss to account for its absence. It is not even found in the sugar yards in any great numbers. I now see why it should be so rare, viz., because it could not of itself pass over the six hundred miles of the windy China sea; and the few which might be transported on vessels, if they got ashore from their distant anchorage, would be prevented from multiplying by their numerous enemies—bats, spiders, birds, lizards, and other reptiles. Some days I would not see one, and rarely more than two, around the table. Were they common, with the other insect pests, life would be almost unendurable in these islands.

IT is now proposed to make nails from Bessemer steel. It is claimed that when made at half the weight of iron, the nail is stiff enough to be driven into the hardest wood, and tough enough to clinch.

Progress of Quarrying.

The Compendium of the Tenth Census, recently issued, contains some figures which will serve to give an idea of the magnitude of the quarrying interests of the country, which in 1880 gave employment to 39,723 men, 8,059 horses, and 851 mules; had 339 machines for quarrying, 2,290 machines for hoisting, 1,308 machines for dressing, and used $192,175 worth of explosives. The capital invested is given at $25,414,497, and the value of the product in the census year at $18,356,055, there being 1,525 quarries in all. Marble and limestone lead the list with 65,523,965 cubic feet, followed by the sandstone quarries with 24,776,930 cubic feet; crystalline silicious rocks, with 5,188,998 cubic feet; and slate, with 457,267 squares, or 4,572,670 cubic feet.

Professor Henry in Bronze.

Story's bronze statue of Professor Henry, for which Congress appropriated $15,000, will be unveiled April 19 in the center of a small triangle at the northwest of the Smithsonian building, Washington. It is seven feet high, and stands on a top and base of Quincy grey granite, with a center of red Beach granite, which adds eight feet to the height of the statue. The name Joseph Henry is cut on the red granite in plain Roman letters, forming the only inscription. The Professor is represented as standing in a meditative mood, with one hand resting on a support, and wears an academic gown. The face and figure were modeled in Italy from photographs and a cast of his face and bust made by the late Clark Mills. President Porter will make the oration.

Nickel for Galvanoplastic Purposes.

Nothing is easier, says the *Central Zeitung fur Optik und Mechanik*, than to cover metals with a thin film of nickel by electric deposition. If we wished to make a very much thicker deposit various difficulties stood in the way, which have but recently been overcome by Boudraux and his son in Paris.

It is generally known that if we attempt to precipitate nickel upon a plaster cast, or wax mould, covered with graphite, as we do copper in electrotyping, as soon as the nickel has attained a certain thickness it cracks loose from the mould and rolls up. This phenomenon is explained as being due to the absorption of hydrogen (occlusion) by the crystalline nickel, which is very porous in comparison with ordinary cast nickel, and is able to occlude 160 times its own volume of hydrogen in twelve hours, when it forms the negative pole of quite a strong galvanic battery.

The above named Parisians have removed this obstacle and are now able to precipitate nickel electrolytically to any desired thickness. At the Paris electrical exhibition they exhibited electrotypes, and art reproductions, which were not plated on the articles but upon casts taken therefrom, the nickel being more than a millimeter thick. An electrotype has several important advantages over mere nickel plating, the most important of which is that by the former all the fine lines and the delicacy of expression are preserved while they are more or less destroyed by nickel plating.

Nickel offers three times as much resistance to mechanical pressure as copper, while the density of the two metals is nearly the same (copper 8·90, nickel 8·57), so that a copy of any work of art when made of nickel can be made much thinner than if made of copper, and yet have the same strength with much less weight. Copies in nickel can be backed to any desired thickness by depositing copper on them by the galvanic current.

The highly valued qualities of nickel are these: It is as hard as steel, less oxidizable than silver, it is not acted upon by sulphides, it can be stretched, and is tenacious, it does not melt easily, and the prices are daily going down.

Nickel would be very useful for stereotype plates from which a great many impressions are to be taken, as for postage stamps, bank notes, etc. Nickel stereotypes would have special value for color printing, because many kinds of colored ink attack copper (vermilion, for example) and destroy the plates, while their own brilliancy is also affected by the copper faced type and plates.—*Deut. Industrie Zeitung.*

IMPROVED FIRE ESCAPE.

We give an engraving of a light, portable, and simple device for receiving persons jumping from upper portions of buildings in case of fire. The apparatus consists of a blanket made of two or more thicknesses of strong canvas provided with coil spring supports and sustained by a folding adjustable frame of wood.

The frame has four legs pivoted together near the middle, and the canvas blanket is secured to a rectangular frame formed of wooden rods linked together at the ends and pro-

JOLLEY'S FIRE ESCAPE.

vided with rings capable of receiving the upper ends of the legs.

The blanket has pockets containing coil springs, which are attached by their outer ends to the rods forming the frame of the blanket. These springs serve to assist the blanket in resisting the shock of the person falling into it. The legs of the escape are made adjustable to adapt it to a rough or sloping surface, and a ladder is provided to enable persons to reach the ground from the blanket. The fire escape is very light and portable, readily set up, and affords a yielding surface upon which people may jump without injury.

This invention has been patented by Dr. William F. Jolley, of Middlesex, N. Y., who may be addressed for further information.

THE "COOLY" TRICYCLE.

Use of Hand Tools in the Schools.

Speaking of the refusal of the Massachusetts House of Representatives to pass to a third reading the measure which authorizes instruction in the elementary use of hand tools as a part of the public school course, the Boston *Journal* says: If the true aim of the school is in reality the preparation for active life, that aim cannot be accomplished by exclusive brain development, for even in the most clerical pursuits the hand must often come to the brain's assistance, and with practical skill be employed in practical uses.

How many of our graduates can drive a nail? How many can split firewood in the easiest way? How many can saw, plane, bore, glue, make a box? Many of our youth in the schools to-day, who seem to lose their ordinary wits when a book is placed before them, would become master workmen with tools, if once given the opportunity of their use; and even the most studious scholars would rather gain than lose with this power over inanimate things which is won by the knowledge of the use of tools. Besides the advantage of manual skill, it has been shown by experience that intellectual training is assisted by a carefully arranged and systematic instruction in this branch of industrial science.

Undue attention to purely mental studies is diverted, the intelligence is aroused, and a healthful and revivifying change is brought about by active occupation. The testimony of physicians has shown the advantage to pupils, physically, in the use of tools. If the course of study is already crowded with different branches, there could easily be formed plans of either omitting a not indispensable study or of adapting the scheme of recitations to the addition of the tool practice. Results in Europe and in this country have proved that this course of elementary training is in nowise a burden, but a benefit to instruction in the regular old time branches. As the educational science advances, new ideas work an improvement upon old methods. It is the spirit of the age to ennoble manual labor, and to teach the young to look upon citizenship through labor as a right beyond the right of birth or wealth. If instruction in the hand working trades can assist in inculcating this true spirit of democracy, it is certainly the privilege of schools to supply the elements of instruction.

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Naphthaline for Agricultural and Therapeutical Uses.

That a coal tar product should find use among farmers and pharmacists, as well as in surgery and dyeing, seems at first somewhat remarkable. Although naphthaline is found in coal tar, it is formed in even greater quantity when naphtha is subjected to a high temperature, and hence is abundantly produced by the process employed in enriching water gas for illuminating purposes.

E. Fischer, of Strassburg, says, in the *Pharmaceutische Centralhalle* of Feb. 22, that one of the most striking characters of naphthaline is the fact that it is not injurious to man and the higher animals, whether breathed as gas or used in substance, externally or internally, while it has a very different action on the lower organisms, both vegetable and animal (fungi, insects, etc.), for they are not able to endure the action of the gas for any length of time.

These, however, are the very properties that a good antiseptic ought to possess. The most common impurity in naphthaline is phenol (carbolic acid), and this, of course, may make it dangerous to man.

To distinguish chemically pure naphthaline from that which contains phenol, a small quantity of it is mixed with very dilute caustic soda solution, boiled a short time, then cooled and filtered. If there was any phenol in the naphthaline it will be found in the filtrate, where it can be detected by acidifying slightly and adding bromine water. A white precipitate, or opalescence, due to bromophenol will be formed if this impurity is present.

Experiments were made on dogs by rubbing their coats with powdered naphthaline all over. The sides and floor of the cage were strewed with it, yet they remained healthy and lively for days. Many persons dislike the smell of naphthaline at first, and in some it causes headache, but they very soon become accustomed to it, as was found in the surgical clinic at Strassburg, where much naphthaline has been used within a few months. Besides, the unpleasant odor can be almost entirely concealed by adding a little oil of bergamot to the naphthaline powder.

The advantages offered by naphthaline as an antiseptic consist: 1. In the simplicity of its application. 2. In its absolute freedom from poisonous qualities, which is such a contrast to carbolic acid, iodoform, and other antiseptics. 3. In the low price, which must be taken into account in charity practice, in the country, and in the field. Ohlgard & Co., of Kehl on the Rhine, make chemically pure naphthaline, which sells for 1 mark per kilo., about 11 cents per pound.

Since naphthaline has been used in larger quantities in the surgical polyclinic at Strassburg, it has been observed that the annoyance from vermin has decreased in a remarkable degree, and now there is scarcely a trace to be found of the fleas that were once so numerous there. It has likewise been employed against the other vermin, head lice, body lice, and especially the itch maggots (*acari*), and it was found that they, too, were destroyed by naphthaline.

If flies, mosquitoes, spiders, etc., are exposed to the action of naphthaline vapors, in a short time they become stupefied, and then die.

Naphthaline has been used for many years as a protection against moths, both in museums, especially in the insect collections, as well as by fur dealers and in domestic uses, and it might be employed in an analogous manner in summer against other insects.

Naphthaline is used successfully in garrisons to get the upper hand of insects, particularly bed bugs. It has been used with very good success as an antiseptic in the surgical clinics at Strassburg.

It seems to have a very energetic action upon the lower organisms of vegetable origin. It kills mould fungi; fruit and vegetables do not mould in an atmosphere of naphthaline. Since these vapors do not hurt men, even if breathed for a long time and in large quantities, it might be used for scarlet fever and diphtheria in children by strewing it abundantly over the floor of the sick room and through the beds of the patients. This precaution has no influence upon the course of the disease, except that it does not spread, as it very frequently did formerly.

Fischer made some very interesting experiments in France, Germany, and Spain upon the use of naphthaline for exterminating phylloxera. It is not necessary to use chemically pure naphthaline for this purpose, as the crude article answers as well. In the London market crude naphthaline costs about $6.25 per ton (2,200 lb.), and in Cologne it is worth $11.25 per ton packed in barrels. These prices permit of its use on a large scale. The first experiments were made April, 1882, upon a vineyard at Bordeaux which had been almost totally ruined by the phylloxera. They generally do their chief damage by destroying the tender rootlets of the vine. Hence the roots of the affected vines were first exposed by digging a ditch along them. The ditch was then partly filled either with naphthaline or a mixture of naphthaline and earth, and then covered with earth. The naphthaline which is in contact with the roots volatilizes slowly; its vapors are as destructive to the phylloxera as to other insects, while the plants themselves receive no injury worthy of mention. About 1 kilo. (2⅛ lb) of naphthaline was applied to each vine. As early as June following the vines that had been treated thus exhibited a good growth. In September they were taken up to examine the condition of the roots. All of the plants, about seventy-five in number, had already put forth new roots, which were perfectly free from phylloxera. The new roots were six or eight inches long, had numerous fine fibers attached, and they were so numerous that it must be acknowledged that these vines had been rescued from the pest.

The roots of many other vines that had not received this treatment with naphthaline had absolutely no sound roots of this year's growth. On uncovering the roots to which it had been applied, a considerable quantity of naphthaline was found there yet in September, a proof that it volatilizes very slowly, and hence its action is very prolonged. It is probable that naphthaline will prove a means of entirely destroying the phylloxera.

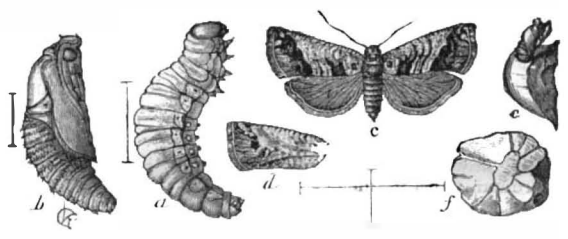
The best method of applying it is to dig a trench six or eight inches deep around the vine, about a hand's breadth distant from it, then put in about a kilo. of naphthaline, and cover it up, stamping it down well, which prevents rapid evaporation.

Naphthaline can also be employed as a prophylactic in regions threatened by phylloxera and also in transporting grape vines. Those which are merely threatened, but not yet attacked, would only require about one-fourth as much naphthaline, say one-half pound. For transporting vines, the tight vessels in which they have to be shipped can be disinfected by strewing naphthaline in them, which would destroy any phylloxera that might be present in the atmosphere.

JUMPING SEEDS AND GALLS.

BY PROF. C. V. RILEY.

Having recently received some fresh specimens of so-called "Mexican jumping seeds," or "Devil's beans," as they are popularly called, I took occasion, while they were yet active, to exhibit them to the Biological Society of Washington, with some remarks, of which I herewith give the substance: These seeds are somewhat triangular, or of the shape of convolvulus seeds, there being two flat sides meeting at an obtuse triangle, and a convex one which has a medial carina. They not only roll from one side to another, but actually move by jerks and jumps, and will, when very active, jump at least a line from any object they may be resting on. The actual jumping power has been doubted by some writers, but I have often witnessed it.



Carpocapsa saltitans: a, larva; *b*, pupa; *c*, moth, enlarged, the natural lengths indicated in hair line; *d*, wing of a pale variety; *e*, a seed showing pupa skin protruding; *f*, a seed showing hole of exit of the moth—both natural size. (After Riley.)

To the uninitiated these movements of a hard seed seem little less than miraculous. They are induced by a plump, whitish lepidopterous larva, which occupies about one-fifth of the interior, the occupied seed being in fact but a hollow shell with an inner lining of silk which the larva has spun. The larva looks very much like the common apple worm, and belongs in fact to the same genus. It resembles that species further in remaining for a long time in the full grown larva state before transforming, so that the seeds will keep up their motion throughout most of the winter months. When about to transform, which is usually in the months of January and February, it cuts a neat circular hole in the convex side of its house, fills the same neatly with a plug of silk, spins a loose tube, and transforms to the pupa state, the moth soon afterward pushing its way out from the little door prepared for it.

The moth was first described in 1857 as *Carpocapsa saltitans*, by Prof. J. O. Westwood,* and afterward as *Carpocapsa dehaisiana* by Mr. H. Lucas.†

In regard to the plant on which these seeds occur there is much yet to learn, and I quote what Mr. G. W. Barnes, President of the San Diego Society of Natural History, wrote me in 1874 concerning it, in the hope that some of the botanists present may recognize it: "Arrow-weed (*Yerba de flecha*).—This is the name the shrub bears that produces the triangular seeds that during six or eight months have a continual jumping movement. The shrub is small, from four to six feet in height, branchy, and in the months of June and July yields the seeds, a pod containing three to five seeds. These seeds have each a little worm inside. The leaf of the plant is very similar to that of the "Garambullo," the only difference being in the size, this being a little larger. It is half an inch in length and a quarter of an inch in width, a little more or less. The bark of the shrub is ash colored, and the leaf is perfectly green during all the seasons. By merely stirring coffee or any drink with a small branch of it, it acts as an active cathartic. Taken in large doses it is an active poison, speedily causing death unless counteracted by an antidote."

In a recent letter he states that he is informed that the region of Mamos, in Sonora, is the only place where the plant grows; that the tree is about four feet high, and is a species of laurel with the leaves of a dark varnished green. "It bears the seeds only once in two years. The tree is called *Brincador* (jumper), and the seeds are called *Brincaderos*. The seeds are more quiet in fair weather, and lively on the approach of a storm."

Prof. Westwood mentions the fact that the plant is known by the Mexicans as "Colliguaja"; and Prof. E. T. Cox, formerly State Geologist of Indiana, now living on the Pacific Coast, informs me that the shrub has a wood something like hazel or wahoo; that the leaf is like a broad and short willow leaf. He confirms the statement as to its poisonous character: that a stick of the shrub when used by the natives to stir their "penola" (ground corn meal parched) purges; and that the shrub is used to poison arrow heads.

The plant is undoubtedly euphorbiaceous.

The peculiarity about this insect is that it is the only one of its order, so far as we know, which possesses this habit, and it is not easy to conceive of what benefit this habit can be other than the possible protection afforded by working into sheltered situations.

The true explanation of the movements of the larva by which the seed is made to jump was first given by me in the Transactions of the St. Louis Academy of Sciences, for December 6, 1875 (vol. iii., p. c. and ci.).

The jumping power exhibited in this "seed" is, however, trifling compared with that possessed in a little gall, and also caused by an insect. This gall, about the size of a mustard seed, and looking very much like a miniature acorn, is found in large numbers on the underside of the leaves of various oaks of the white oak group, and has been reported from Ohio, Indiana, Missouri, and California. It falls from a cavity in the leaves, very much as an acorn falls from its cup, and is sometimes so abundant that the ground beneath an infested tree is literally covered. It is produced by a little black cynips, which was described as *Cynips saltatorius* by Mr. Henry Edwards. The bounding motion is doubtless caused by the larva which lies curved within the gall, and very much on the same principle that the common cheese skipper (*Piophila casei*) is known to spring or skip. Dr. W. H. Mussey, of Cincinnati, in a communication to the Natural History Society of that city, December, 1875, states the fact that such is the case, though members of the California Academy who have written on the subject assert that the motion is made by the pupa, which I think very improbable. At all events, the bounding motion is great, as the little gall may be thrown two or three inches from the earth; and there are few things more curious than to witness, as I have done, a large number of these tiny galls in constant motion under a tree. They cause a noise upon the fallen leaves that may be likened to the pattering of rain.

Various Items.

Prof. Lackie in a recent paper read before the Royal Society, London, maintains that the scientific method of acquiring languages is to learn them in the same way that a child learns, conversationally; and this method should be employed in teaching Latin, Greek, Hebrew, as well as the modern languages. We are under the impression that this idea has been heretofore suggested.—The Royal Swedish Geographical Society has granted its gold medal to Mr. Stanley for African discoveries.—The Dutch Academy has given its gold medal, valued at $200, to M. De Heen, for a work in five sections, relating to the "Physical and Chemical Properties of Simple and Compound Bodies."—M. Marx, an observer in Russia, has found what is believed to be cosmical matter, consisting of iron, nickel, and cobalt, in his pluviometer. This deposit was found after a heavy gale accompanied by snow and rain. It was observed near the time of the November meteors.—Baron Nordenskiold, the Arctic discoverer, is about to undertake an expedition to Greenland. He is to be accompanied by a complete scientific staff, and it is expected that his explorations will result in the acquisition of interesting knowledge. By the way, the Baron is reported to have applied to the Dutch Government, asking the payment to him of a reward of 25,000 gilders, equal to about $10,000, which was offered by the Dutch, about three centuries ago, to whoever would discover a "Northeast passage." The Baron thinks that he has done so. He certainly succeeded in going through from the west to the east by way of the Arctic regions, but it took him two summers to accomplish the voyage. It is a question whether that can be considered a "Northeast passage," which requires the ship to be frozen up through a long Arctic winter, and has been made only in one direction. Furthermore, the reward was addressed to the people then living, and it is questionable whether it would pass to future generations. In some of the States of this country it only requires six years to outlaw a claim. Three hundred years after date seems a long time in which to file an application. We are inclined to think there is some question whether the Baron will ever get the reward.—Mt. Etna is again in active eruption, and is throwing up quantities of red-hot lava which at night time is very luminous. There has been one very violent earthquake shock. This mountain, it will be remembered, is in the Island of Sicily, is 10,835 feet high, and for the last twenty-five hundred years has been celebrated for frequent eruptions. It is a veritable fountain of fire.—In a paper read before the Paris Academy of Sciences, M. Dareste states that he has been enabled to produce monstrosities of poultry by violently shaking hens' eggs before hatching.

* Proc. Ashmolean Soc. of Oxford, 1857, t. iii., pp. 137-8; then Trans. Lond. Ent. Soc., ser. 2, 1858, t. iv., p. 27; also Gard. Chron., 1859, Nov. 12, p. 909.

† "Note sur les grains d'une Euphorbiacee de Mexique sautant au dessus du sol par les vibrations d'une larve de l'ordre des Lepidopteres vivant en dedans."—Ann. Soc. Ent. de France, ser 3, t. vi.; Bull., pp. 10, 33, 44, 1859; t. vii., p. 561-6.

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Correspondence.

The Central Park Obelisk.

To the Editor of the Scientific American:

We learn from your last number, through a letter of Mr. Cummins, of Buffalo, that the Egyptian Obelisk in Central Park is not cut out of the granite quarries of that country, as was stated in your SUPPLEMENT of 1881, but has been made from small pieces of granite ranging in size from that of a walnut to a grain of wheat, and all moulded and held together by some durable cement known and in use in the time of its erection. Mr. Cummins states that he could displace some of these pieces of granite lying near the surface of this stupendous amygdaloid with an ordinary steel pick.

This is all new to us, and contrary to our impressions on looking at the Obelisk, as it seemed to us to have been cut out of the native granite, still leaving the impression of the chisel on the face of the work; showing, moreover, that delicate and beautiful mingling of the hornblende, feldspar, and quartz in every part of the face of the Obelisk without the least appearance of any seams or bands of cement holding distinct and severed pieces of granite together, which, at best, would have given the work an appearance like to that of the amygdaloid or bracksea.

In addition to this we have now before us a piece of the Obelisk.

When it was being removed from the vessel to where it now stands, a piece was spalled off of the base of the Obelisk and picked up by two boys, who gave it to a police officer; he gave it to the police judge of his district, and by him it was given to Judge Cady of this city, who gave it to us.

The fragment is about three inches long and two inches broad, and of a wedge like shape. It is a light drab syenite, and contains large black crystals of hornblende, flesh colored feldspar, and limpid quartz.

It is rough and irregular on all sides but one. On this it is level, and shows the impressions made by the tools of the stone cutter.

It appears equally fresh on all sides, including the one showing the work of the chisel. Hence it must have formed a portion of an inside joint, where it has been protected from the weather. The quartz presents in one small spot a friable appearance, but it is supposed to have been caused by the great force that split this fragment out of the body of the Obelisk without any prior weakness in this part of the rock.

There is no cement in this fragment, nor has it been broken from anything to which it had been fastened by any adhesive substance.

Now, if the theory of Mr. C. be true—which is, that the entire Obelisk is moulded out of small pieces of syenite, held together by some durable adhesive matter—then this piece of the Obelisk must have been spalled out of the inside of one of the spalls used in moulding the column. And, moreover, the amygdaloid, after being set with cement, must have been found to be untrue in some particulars, otherwise the marks of the stone cutter's chisel would not appear on the level side of the spall, as they now do. This was evidently done to fit the Obelisk on the foundation that must have been prepared for its reception. If the Obelisk had been moulded on its foundation, then the fragments of granite and the cement would have conformed themselves to the foundation as they were poured into the moulds upon it, and no cutting could have been done at the base, nor would any have been necessary to make the base of the column fit upon the foundation. The syenite of this Obelisk gives great proof of its durability. It will last almost to an indefinite period of time, and as long in this country as any other with an equal amount of moisture and variation of temperature.

Perhaps there is no granite in this country as durable as that of the syenite of the Obelisk, or where the minerals of rock are so well balanced for durability as they are here. The Scotch granite is claimed to be quite as hard and durable, but on a careful analysis is found to be lacking in some important particulars, and would become friable and rot away thousands of years before this Obelisk would show the least impression from time.

There are a few syenite mountains in the Ozak range of Missouri that in appearance and chemical tests prove to be equal to the granites of Egypt, but they are inaccessible and considered too hard to be worked so as to be put into market on a profit or in competition with softer or more friable granites that are being worked and are considered sufficiently durable for all practical purposes. At all events, we are assured that the Obelisk is solid syenite, and will endure almost as long as time will last. This we could not expect if it were a mere amygdaloid.

GEO. W. CHIN.

St. Louis, March 29, 1883.

Flying.

To the Editor of the Scientific American:

I am greatly surprised to learn that my crude paragraphs on "Flying" have attracted the attention of one so well qualified to discuss a difficult question, and to give a clear view from every standpoint surrounding it, as Mr. F. J. Patten, of the U. S. Army, in the SCIENTIFIC AMERICAN of March 31. I am induced to say, however, that I think he is a little bit inclined to be sarcastic withal.

Mr. Patten says: "There s no use in being scientific by halves." Why, sir, I do not claim to be scientific, even by a sixteenth. What I did say in regard to the comparative strength of man and bird was more of an offspring of impulse than of due reflection.

I do not pretend to know but very little about the question, anyway. I am very careful not to state a thing as a fact unless I know it to be true. I simply know that I can bear my weight, 190 pounds, and 25 pounds extra, on the balls of my toes without the slightest indication of pain. I can hang my weight on a bar by my chin; I can put my feet under one bar and my legs over another, and from a horizontal position raise myself upright by the strength of my knee joints; I can hang my whole weight by two of my fingers, while an equal amount of weight would crush an albatross to death. From these facts I conclude that the muscular strength of man is distributed all over his body, while that of the bird is concentrated in its wing joints.

It was distinctly stated by the *Engineer* that the bird had as much muscular strength as a man, but Mr. Patten says: "It only means that they have greater proportional strength." Then again: "The bird can use a far greater proportional part in the exercise of those particular muscles adapted to locomotion than man or any vertebrate animal can do." That may be true, if ninety per cent of its strength is located there. But even that remains to be proved.

As to its "burning of carbon," that is a lantern that he has hung altogether too high for my short literary stature. I'll not meddle with it.

But for his "largest approximation to a flying machine that nature has given us," I will just simply cite this paragraph from Wells' Geology:

"The size of the pterodactyl may be inferred from the circumstance that the wings of one specimen which has been found must have had a spread of not less than twenty-seven feet, while the spread of the wings of the great condor of the Andes—the largest of flying birds—does not exceed twelve feet.

SAMUEL B. GOODSELL.

Brooklyn, April, 1883.

Bronze Powder and Bronzing.

Bronze powder is finely pulverized metal or powder having a metallic base, applied to the surface of various articles for the purpose of imparting a metallic color or luster.

Gold powder for bronzing is made by grinding leaf gold with honey, dissolving the mixture to obtain the gold by deposition, the honey water being decanted. German gold is a yellow alloy leaf similarly treated.

Mosaic gold is prepared by incorporating and grinding: tin, 16; flower of sulphur, 7; mercury, 8; and sal ammoniac, 8; then subliming the amalgam. A flaky gold colored powder remains in the matrass.

Copper powder is obtained by saturating nitrous acid with copper, and then precipitating the copper by exposing iron bars in the solution.

Bisulphide of tin has a golden luster, flaky texture, and is used for ornamental work, such as paper hangings, and as a substitute for gold leaf.

Dutch foil, reduced to a powder by grinding, is also used, and powdered plumbago gives an iron colored shade.

Another kind is made from verdigris, 8; putty powder, 4; borax, 2; niter, 2; bichloride of mercury, ¼; grind into a paste with oil and fuse them together.

Another (red): sulph. copper, 100; carb. soda, 60; mix and incorporate by heat; cool, powder, and add copper filings, 15; mix; keep at a white heat for twenty minutes; cool, powder, wash, and dry.

Bronzing is the process of giving a bronze like or antique metallic appearance to the surface of metals.

The processes vary; they may be classed as coating with a metal alloy, coating with a metal in paste, solution, or vapor, corrosion, coating with a gum, applying bronze powder, and painting.

The modes vary with the material. The methods as to copper (some of them applicable to brass) are as follows:

1. The surface is cleaned, polished, and a paste of crocus powder and water applied to it. Apply heat to develop the color required.

2. Plumbago applied in the same manner. By applying mixtures of plumbago and crocus different shades are obtained.

3. The copper is exposed at a high heat to the fumes of zinc.

4. The copper vessel is filled with water acidulated with hydrochloric acid, an amalgam of zinc and cream of tartar being added. Boil for a while. The two latter processes are more properly brassing.

Corrosion processes are as follows:

Wash the cleaned copper with a dilute solution of sulphuret of potassium, or hydrosulphuret of ammonia is applied with a brush.

Apply a solution of verdigris, 2; sal ammoniac, 1; and vinegar, 16. Or, verdigris, 2; vermilion, 2; alum, 5; sal ammoniac, 5; vinegar sufficient to form a thick paste. Blue vitriol inclines to dark brown, borax to yellow brown. Or, sal ammoniac, 1; cream tartar, 3; common salt, 3; hot water, 16; dissolve, and add nitrate of copper, 3; dissolved in water, 8; apply repeatedly with a brush. Or, salt of sorrel, 1; sal ammoniac, 3; distilled vinegar, 32; apply as above.

For iron: Clean the metal, and wash it or immerse it in a solution of sulphate of copper, or verdigris, when it will acquire a coating of copper.

The metal may be dipped in molten metal, copper, or its alloys.

The polished metal—a gun barrel, for instance—may be dipped in a solution of chloride of antimony and sulphate of copper. This is browning.

The ordinary solution consists of aquafortis, 1; sweet spirits of niter, 1; blue vitriol, 4; tincture of the muriate of iron, 2; water, 32.

The iron is cleaned, polished, and lacquered. The lacquer consists of shellac in alcohol, with or without the addition of saffron, annatto, aloes, or other coloring substances.

The iron is cleaned, polished, coated with linseed oil, and heated to develop the tint required.

For tin: Clean the castings, and wash them with a mixture of 1 part each of sulphate of copper and sulphate of iron in 20 parts of water; dry and wash again with a solution of verdigris, 5 parts; in distilled vinegar, 11 parts. When dry, polish with colcothar.

Plaster of Paris statuettes, models, etc., are bronzed in the following manner:

Prepare a soap from linseed oil boiled with caustic soda lye, to which add a solution of common salt, and concentrate it by boiling till it becomes somewhat granular upon the surface; it is then strained through a linen cloth, and what passes through is diluted with boiling water, and again filtered. Dissolve 4 parts blue vitriol and 1 part copperas separately in hot water, and add this solution to the solution of soap as long as it occasions any precipitate. This flocculent precipitate is a combination of the oxides of copper and iron with the margaric acid of the soap, the former giving a green and the latter a reddish brown color, the combination of the two resembling that greenish rust which is characteristic of ancient bronzes. When the precipitate is completely separated, a fresh portion of the vitriol solution is to be poured upon it in a copper pan, and boiled in order to wash it. After some time the liquid is poured off and the soap washed with warm and afterward with cold water, pressed in a linen bag, drained, and dried, when it is ready for use in the following manner:

Three pounds of pure linseed oil are boiled with 12 pounds of finely powdered litharge, and the mixture is strained through a canvas cloth and permitted to stand in a warm place until it becomes clear. Fifteen ounces of this, 12 ounces of the above described soap, and 5 ounces of fine white wax are melted together at a gentle heat in a porcelain basin, by means of a water bath. The mixture must be kept some time in a molten state, to expel any moisture which it may contain. It is then applied by means of a paint brush to the surface of the gypsum, which is heated to the temperature of about 200° F.

After exposure to air for a few days the surface is rubbed with cotton wool or a fine rag, and variegated with a few streaks of metal powder or shell gold. Small objects may be dipped in the melted mixture and then exposed to the heat of the fire until thoroughly penetrated and evenly coated with it.

The *Glassware Reporter*, from which these particulars are derived, says:

The bronze letters and figures upon the bonds and paper currency of the United States—as, for instance, "the faint attempt at a metallic ring," as Secretary Chase called it, on the old twenty-five cent fractional currency—are made by printing in drying oil and applying the metal in fine dust to the damp surface.

Evaporation of Fruit.

The following by Amos Stauffer, of Waynesboro, Pa., was read before the third National Agricultural Convention, Chicago, December, 1882:

The best method of increasing the value of our domestic fruits, as I comprehend it, consists in familiarizing our farming community with the simplicity and cheapness of the evaporating process, and convincing them that it is a legitimate, profitable, and easy adjunct of farm or household labor.

Evaporated fruit is worth from 200 to 400 per cent advance over the same fruit sun or oven dried, the labor of preparing the fruit (which is the greatest item) being the same in both cases. The actual cost per pound of finished product, without regard to quality or value when prepared, is about the same.

Briefly stated, our farmers' wives, sons, and daughters now exchange the product of our orchards, with their labor added, at a discount of from 50 to 400 per cent below the product of the less intelligent colored laborer in the tropics. At the village store or warehouses of the metropolis of the West the unequal exchange is daily made; two or three pounds of dried apples go for one pound of figs, dates, currents, raisins, or prunes, while our dried peach in exchange is scarcely at par. That our domestic fruits in themselves are superior to those of the antipodes needs no further argument than a comparison of daily quotations between our evaporated fruits and those offered by the tropics.

Every pound of evaporated apples offered has a value in Chicago equal to about two pounds of tropical dried fruits, while evaporated peaches readily command from three to four pounds of currents, figs, dates, raisins, or prunes, etc., thus practically reversing old customs and values.

NEW subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT, who may desire to have complete volumes, can have the back numbers of either paper sent to them to the commencement of the year. Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT for 1882, may be had at this office, or obtained through news agents.

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DOWSON'S GAS PRODUCER.

We annex illustrations of the latest form of gas producer designed by Mr. J. Emerson Dowson, of 3 Great Queen Street, Westminster, and especially adapted for supplying gas engines.

The engines of this kind made by Messrs. Crossley Brothers, of Manchester, are known to have a very high efficiency. The power required at these works will probably be 200 to 300 horse power, and Messrs. Crossley have decided not to employ steam, but to drive all their machinery and tools with gas engines. Several preliminary trials were made with the gas produced in the Dowson apparatus, and the results were so satisfactory that it has been adopted for permanent work, and already nearly all the gas producing plant for 150 horse power has been laid down.

An engine, indicating from 27 to 30 horse power, has been working regularly with this cheap gas over two months. During this time tests have been made to determine the actual fuel consumption, and the following are the results obtained, so says *Engineering:*

1. Time allowed to get generator fire in order for making good gas, 45 minutes.

2. Fuel consumption per 1,000 cubic feet passed into gas holder, 13·2 lb.

3. Gas consumption per indicated horse power per hour, 109 cubic feet.

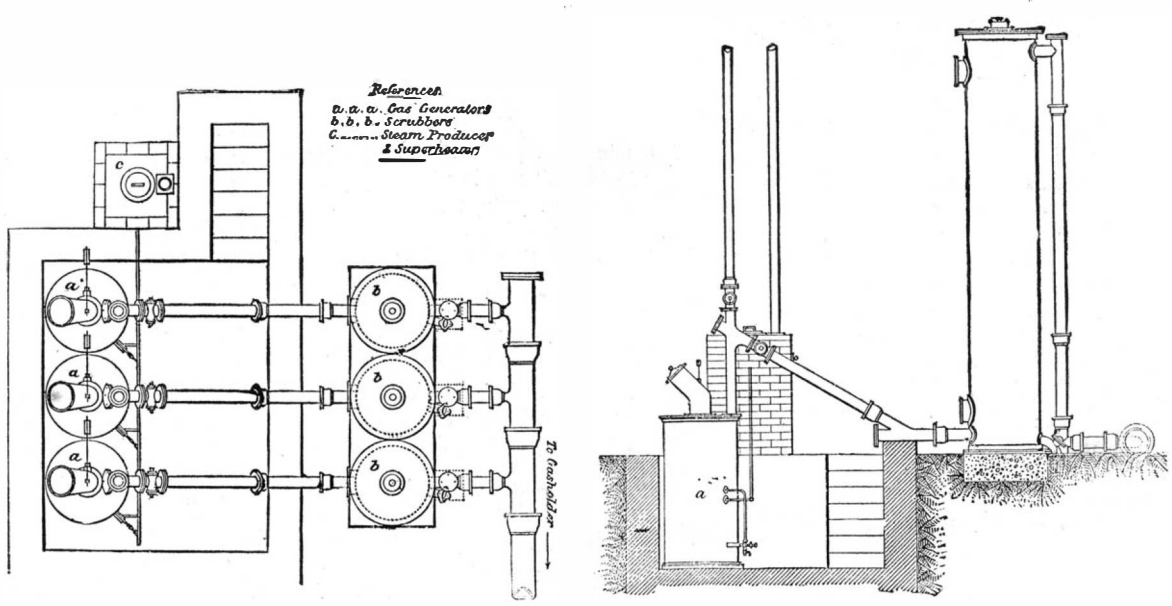
4. Fuel consumption per indicated horse power per hour, 1·4 lb.

These results confirm the tests made by Mr. D. K. Clark, for the Committee of the Smoke Abatement Exhibition, with a 3½ horse power Otto engine worked with the cheap gas. He gave the following: 1. Gas consumption per indicated horse power per hour, 110·3 cubic feet. 2. Fuel consumption per indicated horse power per hour, 1·4 lb.

The engine now working with this gas at Messrs. Crossley's new works is driving the foundry blower, which delivers an average of about 4,000 cubic feet of air per minute, and a mercury gauge indicates with accuracy the steadiness of the driving. The fuel used in the gas generators is small sized anthracite from South Wales, costing 3*s.* 3*d.* a ton in truck at the pit.

It will be seen that the fuel consumption is remarkably low, even with so small an engine as a 3½ horse power, as reported by Mr. D. K. Clark. The wages of the firemen for the gas generators are not more than for a set of steam boilers. It should also be mentioned that the gas can be conveyed to any part of the works without condensation, that separate engines can be used for different lines of shafting, and that this not only effects a saving in the cost of shafting, but any department working overtime can have its engine supplied with gas from a single gas generator.

The arrangement of the plant will be understood from the drawing, in which *a a a* are three producers, cylindrical iron chambers, lined with ganister, closed at the top, and provided with grate bars near the bottom, on which the anthracite, fed in from the hoppers at the top, is consumed. Steam is generated in a coil contained in the square furnace, *c*, and is led away by the steam pipe shown, provided with jets discharging into each producer, and drawing with this a considerable quantity of air. The gases generated are led off to the pump gear, *c c c*, and then to the holder (not shown in the drawing). From this holder the supply is delivered as required to the gas engines.



DOWSON'S GAS MAKING PLANT.

The Girls should Exercise.

Dr. Alice F. Freeman, of Wellesley College, says that the cause of the breaking down of the girls in institutions of learning is the lack of proper physical care before entering. Experience shows that in the boarding schools where exercise is compulsory the students improve in health, but college is not a place for invalids, and those with weak constitutions and nervous prostration are likely to become ill. Girls have not as vigorous a physique as boys, but they are capable of greater endurance, and with proper care can sustain as thorough a course of mental training with benefit rather than detriment to their health.

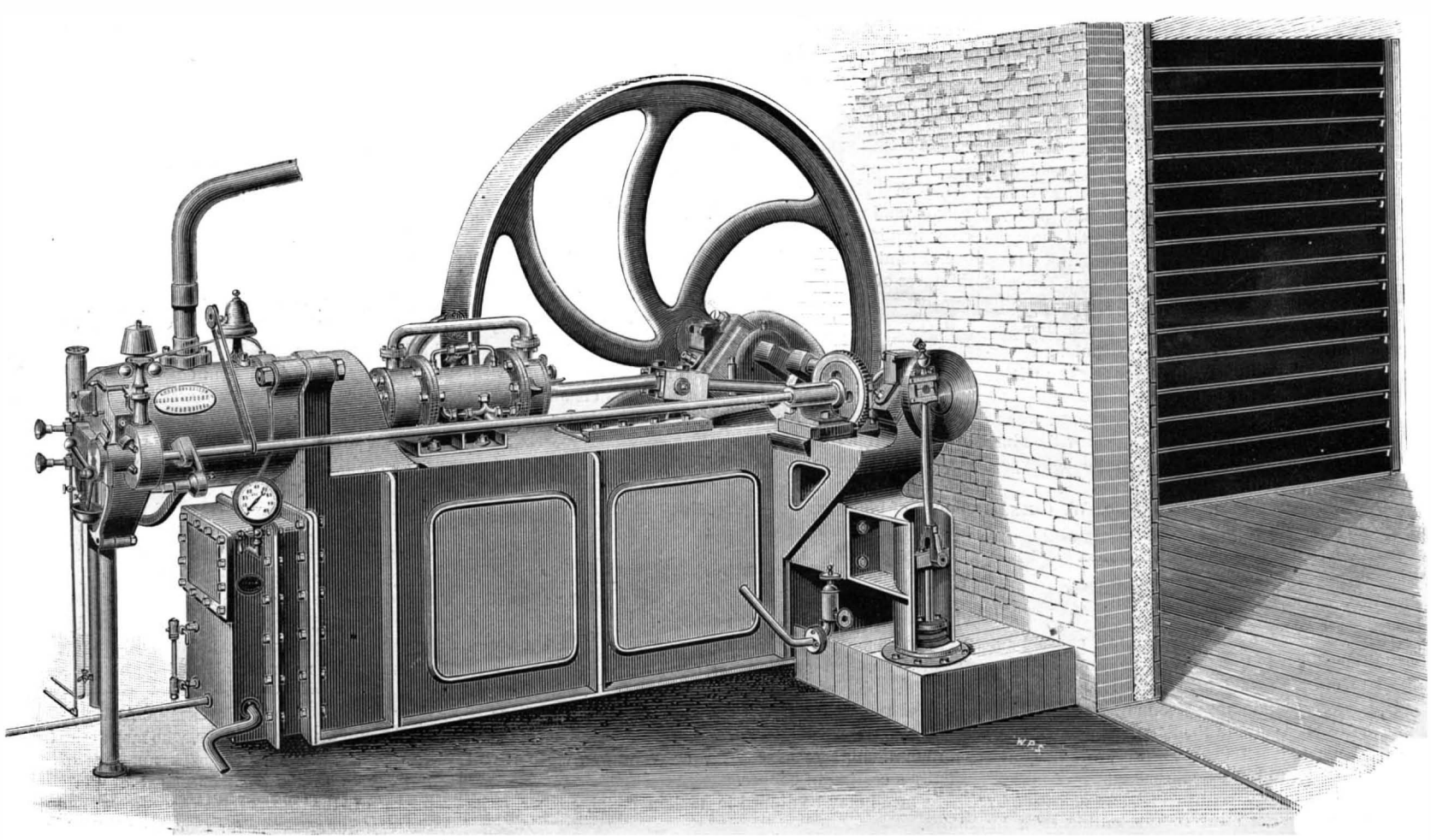
COMBINED GAS MOTOR AND REFRIGERATOR.

Our engraving shows a perspective view of the apparatus, together with a portion of the cooling chamber. The machinery which has to be driven is of the well-known Bell-Coleman type, and we need only here observe that the essential feature of the process consists in drying the air before expansion. This is carried out by passing the moist air, while in a state of compression, through a series of tubes placed in a colder atmosphere, or waste air current from the chamber, which causes the moisture to deposit on the surface of the tubes, whence it is removed by automatic traps before entering the expansion cylinder. The pipes have also the effect of considerably reducing the temperature of the compressed air below the temperature of the cooling water, and, consequently, when permitted to expand, it produces proportionably lower terminal temperatures, thus giving greater efficiency per indicated horse power.

On reference to our engraving, it will be seen that an air compressor is placed on the top of the bed frame, and the gas motor cylinder is placed on the same line as the compressor at one end of the bed frame, which it overhangs, as is usual in the Otto engine. The piston of the gas motor cylinder is on the same rod as the piston of the compressors, and this rod is connected to the crank shaft by a connecting rod. On one end of the crank shaft there is a fly wheel, and at the other end of the shaft a crank disk, to which is attached at right angles the connecting rod and piston of the cylinder, in which the compressed air (after having been deprived of the heat produced during compression) is expanded in the act of doing work. The valve gear of the gas motor is that usually adopted in the Otto engine. The process may be briefly described as follows:

Atmospheric air is taken into the compressor, and therein compressed to about 4½ atmospheres absolute, or say 50 pounds above atmospheric pressure. A considerable amount of heat is produced in this operation, which is removed from the compressed air by water, and to such an extent as to make the temperature of the air, after compression, about the temperature of the water used in cooling, which is generally from 60° to 80° in ordinary practice. The object is effected by forcing water partly into the compressor and partly into the air immediately after leaving the compressor, the operation being completed and the surplus removed in the usual way in a chamber connected with automatic water traps. The compressed air, now free from mechanically suspended water, and still under compression, is led through horizontal pipes fixed in the sole plate, and which are surrounded by cold air returning from the room being refrigerated. The pipes act as heat exchangers, and also as moisture depositors, as they reduce the temperature of the compressed air considerably below that of the water.

The compressed dry air, which in ordinary practice is now generally of a temperature of 50° above zero, is taken to the expanding cylinder, constructed on the type of a steam cylinder, where it is expanded, and power is developed by the expansion, the power being utilized in the driving of the whole machine through the crank shaft, the air at the same time being reduced from 50° above zero to 50° below zero. The machine which has been erected in Leadenhall Market is employed in cooling a chamber which contains poultry and game. The compressor of this machine is 8½ inches diameter and 12 inches stroke; the expansion cylinder is 6 inches diameter and 9 inches stroke. It delivers



COMBINED GAS MOTOR AND REFRIGERATOR.

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cold air at the rate of about 5,000 cubic feet per hour, at a temperature 50° below zero, when working at a speed of 140 to 160 revolutions per minute, which is capable of being continuously maintained, provided the water supply and lubrication are attended to.

The chamber with which this machine is connected is 15 feet long by 20 feet broad and 9 feet high, and in the hottest days of the late summer its temperature was easily reduced to from 30° to 40° Fahr. by six or eight hours' working. There can be no doubt but that this machine will be found exceedingly useful for the preservation of food and other perishable goods in places where steam power is inadmissible, but more especially in the climates where high temperatures prevail.

We are pleased to note this practical advance, which has been made by Mr. J. J. Coleman, who was the first to make mechanical refrigeration a success on board ship, where it is now very extensively employed. Scarcely three years and a half have elapsed since he sent out to New York the first cold air machine successfully used in bringing meat across the Atlantic. At the present time machinery on the lines designed by Mr. Coleman and partners, and known as the Bell-Coleman machines, are fitted up in various parts of the world, their steam cylinders being capable of indicating in the aggregate 4,000 horse power, and their cooling capacity being equal to the freezing of 200,000 tons of meat per annum. These machines are working not only between America and Great Britain, but also between Australia, New Zealand, and India, and this country.—*Iron.*

THE ELECTRIC LIGHT IN SURGICAL DIAGNOSIS.

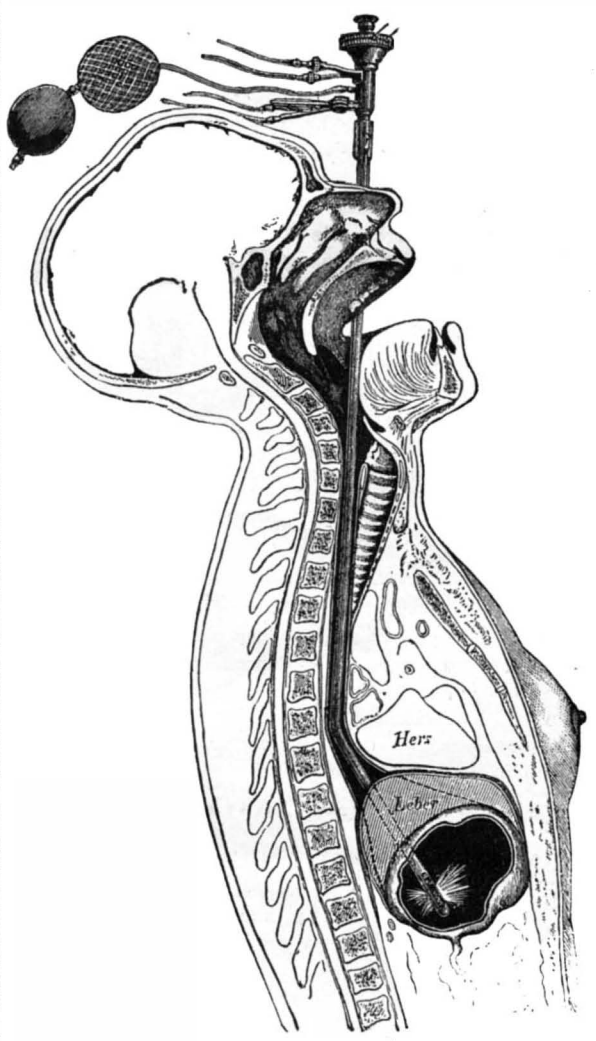
We find in a recent number of *Annals of Anatomy and Surgery* a very interesting contribution by Dr. Roswell Park, of Chicago, in which he describes the most recent applications of the electric light for surgical purposes. It appears that Josef Leiter, a well known instrument maker of Vienna, has at last succeeded in producing electrical instruments by which the interior portions of the human body may be strongly illuminated by the electric light, and thoroughly examined by the eye of the surgeon.

The accompanying engraving shows the application of one form of these new instruments, called the gastroscope, an instrument for the examination of the stomach. It consists of a bent tube, which contains a window at one end, electric wires, tubes for the introduction of a water circulation, by means of rubber bags, for the purpose of keeping the tube cool while the electric light is burning; also for the introduction of water into the stomach, to distend the same. The lower extremity of the tube is provided with a platinum wire, which is made to glow under the electric current, which is produced by a battery. The tube is also provided with reflector prisms and lenses, for directing the light through the tube.

The eye of the surgeon is applied at the upper end of the tube, after it has been inserted in the stomach in the manner indicated in our sketch.

As preparation for the use of the gastroscope, it is necessary that the patient shall have gone for some hours without eating. Half an hour previous to its use a hypodermic dose of morphia, say one-third grain, should be administered. Just prior to the examination the stomach should be washed out. The patient is then laid upon the left side on a table, having a head support, which shall keep the neck in its axial position. A small receptacle is placed under the mouth to catch the saliva which cannot be swallowed. The head is then thrown well back, and the instrument, which has previously been lubricated with vaseline or glycerine, is guided by the finger of the left hand and passed downward with a gentle sweep.

Previous practice on the cadaver with a hard rubber sound of the same dimensions and flexure as the gastroscope will



THE ELECTRIC LIGHT IN SURGICAL DIAGNOSIS.

easily teach the necessary manipulations. The instrument being in place, the stomach is inflated to the desired extent, but not sufficient to distress the patient. The pointer on the rheostat being turned slowly, the metal blind is drawn (at J), and the observer has the field before him.

By the curve in the tube not only is the introduction of the instrument facilitated—it having been found impossible to pass a perfectly straight tube so far as is necessary for this purpose—but it will be seen that with partial rotation of the tube about the long axis of the straight portion, the extremity carrying the window and the light makes quite an excursion, and permits the view of a much more extensive surface than would be possible were no such excursion made.

Moreover, as it is provided with an optical system, it obtains that as the instrument is rotated toward a given point of the mucous membrane its image is enlarged; while as it is further removed the image is diminished, while the field is enlarged. At a distance of two centimeters the image is of natural size. The "definition" of this system is excellent, and, granted a tolerance of the instrument on the patient's part, and the requisite skill on that of the observer, a very satisfactory examination can be made.

A variety of other instruments are made, which are operated substantially in the same general manner as the one described. For example, we have the laryngoscope, for examination of all parts of the throat; the œsophagoscope, for the gullet; the otoscope, for the ears; the urethroscope, for the bladder; the cystoscope, etc. The invention of instruments marks another step in electrical progress. They promise to be of utility and importance to the medical profession, for by their use many parts of the human system heretofore hidden from the eye may now be brilliantly lighted and examined, and their condition in disease and health ascertained.

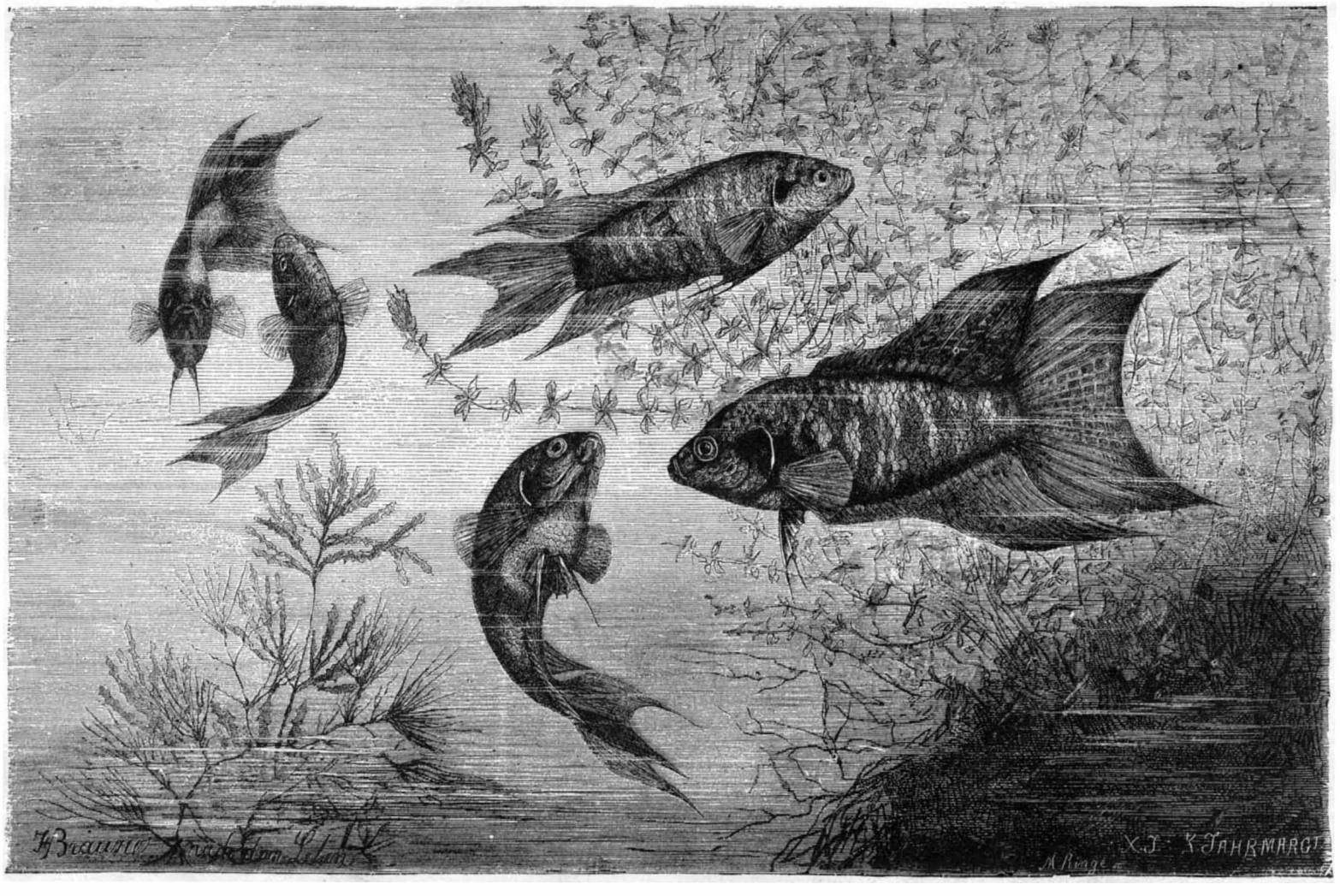
THE PARADISE FISH.

The paradise fish is a representative of the family *Macropus.* These fish have very large fins, less developed in the female. The brownish color of the upper side changes into a greenish gray on the lower side; the markings consist of changeable yellowish green or blue and red cross lines. Their length is from eight to nine centimeters.

Very little is known of these fish in their free life. They are universally kept in captivity in China, and treated as our gold fish, but are more easily propagated in a limited space.

They are better adapted for household pets than other fish of this class, as they can live in a much less quantity of water, and can remain out of the water for twenty minutes and more without injury. Giraud brought one hundred of these fish from China, and although during the tedious journey he was not able to give them sufficient room or the necessary care and nourishment, twenty-two of them lived.

Benecke says that "in May of the year 1878 he obtained a pair of paradise fish. They were placed in a basin containing about forty liters of water. They immediately went to work to devour the small crawfish and larvæ of insects which had been placed in the vessel. After these were consumed two crawfish, water fleas, and mussels were put in. The mussels they had not received before, and evidently had never eaten them, for at first they only took hold of the little animals and then released them with a shake of the head, but after a day or two they only ate the mussels, leaving the water fleas placed in the basin unmolested. One day no mussels could be obtained, and they ate greedily not only small but very large angle worms from five to eight centimeters long and two millimeters thick. They always rejected the intestines of the worms. When the worms were put in the basin, as they were taken from the ground, they would shake them two or three times, then let them go, then throw them around in the water, in order to shake off the dirt before eating them. If the worm struggled, they would sling it against the water plants or the sides of the basin.



THE PARADISE FISH.

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About three weeks after the fishes were received the male began to build a nest. For this purpose he would come up to the surface of the water, take his mouth full of air, thrust it under the water, forming small bubbles of film like spittle, and continue thus to build a layer of these bubbles hanging quite firmly together, adding new layers until it was completed.

About twenty four hours after the spawning, the germ may be perceived in the pale yellow yolk of the egg—a day later the heart begins to beat—twelve or eighteen hours after the young, imperfect fish escapes from the egg, it is similar to a small tadpole. In eight months it is full grown. So long as the fish needs parental care the male devotes himself to it. As soon as the young fish starts away he hastens after it, seizes it with his mouth, swallows it, and spits it out into the nest of foam. They care specially for the sick and feeble ones. As soon as the young fish no longer needs his assistance he forsakes it, without appearing to have any interest in its fate, and has no hesitation in devouring it.

The young subsist at first upon the foam of the nest, later upon small animalcules not visible to the naked eye, and finally upon the same food as the parents.—*From Brehm's Thierleben.*

Fire Resisting Doors and Shutters.

Experience has proved that the ordinary iron doors and shutters usually employed in warehouses do not afford the protection from fire (especially if a large one) that might be expected from them. The *Insurance World*, on this subject, mentions many instances where wood incased in tin has proved quite effective in preventing the spread of fires, but the writer also pertinently asks if human ingenuity cannot devise a door or shutter which will be more fire resisting?

Some English writers have expressed a decided preference for solid oak cased with tin or sheet iron over the ordinary rolling iron shutters, and, according to the *Insurance World*, as stated above, tin faced wooden doors have proved to be very efficient in this country. Mr. James Harrison, Superintendent of the Bureau of Surveys in the New York Board of Fire Underwriters, not long ago indorsed on the specification of a building about to be erected, as follows:

"Construction of doors and shutters herein described approved by the Board of Fire Underwriters. Batten doors, covered with metal, have been commended and preferred to iron doors for a long time."

The specification bearing the above forcible indorsement read as follows:

1. "*Iron doors.*—Iron doors are much better than nothing, as they will often check the spread of a moderate fire. In the case of a heavy fire, the heavier the frame the more likely they are to warp. Besides the usual danger of twisting and warping, they are liable to become red hot, and thus to communicate fire to contiguous goods.

2. "*Metal lined doors.*—The experience of underwriters shows that the most desirable doors are those constructed of double thickness of one inch tougued and grooved boards, crossing one another diagonally, well clinched and riveted. Then completely covered on edges and sides by jointed (not soldered) tin of the best quality, and nailed on under each joint with shingle nails. These doors to be hung with wrought iron strap hinges, crossing the width of the door and firmly bolted, and to be firmly latched into the solid wall. In size they should be two inches wider and higher than the passage way, and should be placed on opposite sides of the wall. When thus made, these doors will outlast a fire which would destroy the best of iron doors.

"Window shutters should be of similar construction."

Doors of this construction have not only been approved, but practically tested by fire. The English article approved of oak, which certainly would be better than most iron doors, but, when hermetically sealed in tin, the wood is transformed into charcoal and easily fractures across the grain. The tough yellow pine of this country burns very readily in an open fire, but does not lose its fibrous texture when charred. So our insurance contemporary thinks it may be preferable to a less inflammable wood in the hour of emergency.

Property owners often prefer galvanized iron to tin, but the former presents a greater metallic body to the fire, rises in blisters, and is not as desirable as the non-flexible tin, which is closely nailed at every joint. Human ingenuity may yet devise some better plan for protecting the doors and windows of warehouses; certainly some better fire resisting substance and arrangements than are now employed are very much needed.

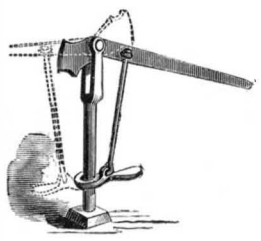
Preservation of Yeast by Cold.

It has already been shown by some experiments of Dr. Lintner's that yeast may be preserved, and yet retain its full vitality by being frozen. A practical confirmation of this on a large scale has just been obtained by H. Von Planitz. A quantity of yeast, which had been badly packed, was consigned to him, and on arrival, during some very severe weather, was found to be completely frozen. The solid block of yeast was broken to pieces by aid of a chisel and hammer, and crushed to a powder under a mallet; it was then mixed with water, and when the yeast had deposited, the ice which came to the surface was removed. Afterward the yeast was used in the usual manner, and yielded very good results, and yeast derived from it was in use for several months without showing the slightest signs of degeneration. Although these results fully confirmed the view that yeast is not injured by extreme cold, the same observer made a further experiment; he submitted a quantity of well-washed yeast to intense cold, and having frozen it into a solid mass, he kept it for four weeks at a temperature just below freezing. This yeast, on being used, gave equally good results. The experiments here referred to were with "bottom" fermentation yeast, but there is no reason to suppose but that similar results would be obtained with "top" yeast.

RECENT INVENTIONS.

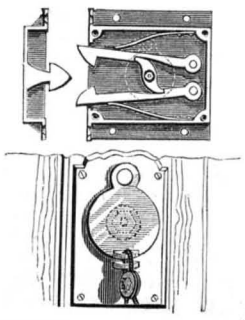
New Wagon Jack.

This a simple and inexpensive jack for use in removing the wheels from the axles of wagons or other vehicles. It consists in a lever combined with a post, and a clutch ring fitted on the post and connected to the lever for holding the latter in any position to which it may be moved in raising the axle. The lever may be reversed to adapt the jack to axles of different heights as indicated in dotted lines in the engraving; the rod of the clutch being loosely connected at both ends to admit of this arrangement. This jack can be readily operated without the necessity of crawling beneath the wagon to put it in place. It is very light and at the same time strong and durable, and can be folded up in a compact shape when not in use. Mr. Alonzo B. Furman, of Strattonville, Pa., is the patentee of this invention.



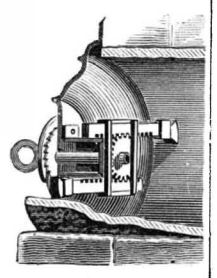
Lock for Sliding Doors.

The engraving shows a novel lock applicable to sliding doors and gates generally, but specially designed for the sliding doors of freight cars on railroads. The lock is provided with movable jaws or hooks pressed by springs and limited in their movement by stops. These hooks engage with a catch of dart-head form, and are separated so as to release the catch by means of a tumbler, which acts on both hooks alike. The tumbler is fitted with a key which will turn it when properly inserted, and the keyhole is provided with an escutcheon that may be sealed, so as to close the lock effectually. This useful invention has been patented by Messrs. Charles S. Rees and Patrick Mills, of Pueblo, Colorado.



Improved Flue Stop.

This is a flue stop that will fit and cover different sized flue or stove pipe holes, and which, although working in connection with the thimble or other lining of the flue hole, is an independent structure, and is capable of being adjusted so that no amount of soot or other dirt or wind will force it out of its place. The invention consists in the combination, with a flue hole plate or cover, of anchoring braces capable of being adjusted in opposite directions by a pinion working in racks on the braces. The braces are fitted with rubber bearing blocks on their outer ends, to insure a firm hold of the braces in the chimney crock or thimble. A spring pawl engaging a ratchet on the spindle of the pinion holds the braces extended, and thus secures the stop. The stop is released by disengaging the pawl from the ratchet, and turning the spindle so as to retract the braces. This useful invention has been patented by Mr. James W. Webster, of Monticello, I .

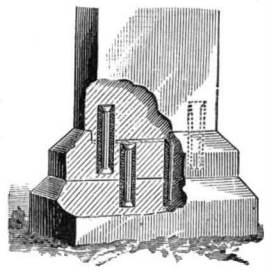


Improvement in Oil Cans.

The object of this invention is to prevent the oil outlet of an oil can from getting stopped up, to enable the operator to see how much oil is given to each hole, and to facilitate the removal of dirt and grease from the oil holes before oiling. The invention consists in the combination, with an oil can, of a wire passing loosely through the nozzle and into a tube secured on the bottom of the can and within it. The outer end of the wire is curved, and part of the wire is finely grooved or roughened. By pressing on the bottom of the can in the usual manner, the wire is moved forward and back longitudinally in the nozzle, and the oil that is spurted out passes in single drops along the wire. It cannot drop from the same until it arrives at the end, for the fine grooves or roughnesses between the points assist materially in preventing the oil from dropping off the wire, and at the same time facilitate the flow of the oil toward the end of the wire. Address the patentee, Mr. J. A. Campbell, care of Wallace & Brooks, Waco, Texas.

Improved Tombstone.

The engraving shows a tombstone, the several parts of which can be united easily and quickly in such a manner that the whole will be very rigid. The base is formed of a bottom section, and an upper section on which the top stone rests. The upper base section is provided with a mortise in its top, into which a tenon formed on the lower end of the top stone is fitted. Two or more holes are bored in the lower end of the top stone, and dowel pins having enlarged or widened ends are passed into them, and then the space between the pins and the sides of the holes is filled with melted sulphur. In a similar way holes for receiving pins are formed in the top of the upper base section and extend through into the top of the bottom base section, and pins with enlarged ends are passed into the holes and fastened as in the first case. This forms a permanent fastening that will last as long as the stone endures. Mr. William Mould, of Saugerties, N. Y., is the patentee of this invention.



On the Action of Certain Metals upon Oils.

Some time since Chevreul, the distinguished investigator of the fats and oils, studied the effect produced upon the drying oils by different metals. (*Memoires de l'Acad.*, xxii.) He found that under certain circumstances metals exerted an influence upon the oxidation of the oils; for example, linseed oil when spread upon a sheet of lead dried immediately.

A. Livache believed that the metals would act more energetically if in the fine state of division in which they are obtained by precipitation from solution, instead of using only surfaces of sheets of metal. His experiments, which are exceedingly interesting, were published in *Comptes Rendus*, xcvi., 260.

Livache tried the effect of tin, copper, and lead on the oils, but only the last named exerted any considerable action. The lead employed in the experiments was obtained by precipitation with strips of zinc from the solution of a lead salt; it was quickly washed with water, then with alcohol and ether, and finally dried *in vacuo*. If this lead is moistened with a certain quantity of oil and then exposed to the air, in a short time an increase of weight is observed, and the more drying the oil the greater this increase. When raw linseed oil is treated in this way, the increase of weight attained its maximum in thirty-six hours, while the same oil, if merely exposed to the air alone, requires several months to reach this state. A solid but elastic substance is formed like boiled linseed oil dried in the air.

Experiments made with different oils show that the increase of weight is nearly the same as that of their fatty acids when exposed to the air for a few months.

Name of oil treated with precipitated lead	Increase of weight in oil. In 2 days.	In 8 days.	Increase of weight of fatty acid. In 8 months.
Linseed	14·3 per cent.	....	11·0
Walnut	7·9 "	....	6·0
Cloves	6·8 "	.	3 7
Cotton seed	5·9 "	....	0·8
Beech nut	4·3 "	...	2·6
Rape	0·0 "	2·9	2·6
Sesame	0·0 "	2·4	2 0
Peanut	0·0 "	1·8	1·3
Rape seed	0·0 "	2·9	0 9
Olive oil	0 0 "	1·7	0 7

Cotton seed oil was the only drying oil that showed a marked exception; the fatty acid from it exhibited a very slight increase of weight. That is probably the reason why this oil can play a double role, as a drying and as a non-drying oil, for it is used to adulterate linseed oil on the one hand and olive oil on the other.

Contact with precipitated lead, then, imparts to oil the property of absorbing oxygen rapidly. In his study of the oxidation of the oils, Cloez has shown that it is always attended with the total disappearance of the glycerine, and in Livache's experiments it was noticed that the glycerine was modified by the precipitated lead. If glycerine is mixed with precipitated lead in a tight bottle free from air, the lead soon vanishes, being oxidized at the expense of a portion of the glycerine, and then dissolved in it. [This may help to explain the action of the new French form of electric accumulator, where the lead plates are placed in glycerine.]

The facts above stated indicate that a rapidly drying oil can be obtained by simply treating linseed oil for some time with red lead or litharge, although the product thus obtained always remains greasy and does not dry as good and quick as boiled linseed oil.

In the arts advantage may be taken of this action of lead toward drying oils, as for example to prove the presence of cotton seed oil in linseed oil as well as in olive oil. Probably boiling may be dispensed with by substituting mere contact of the oils with precipitated lead, or solutions of lead and strips of zinc on which the lead may be deposited in a fine state of division. Oils prepared in this way are always of a lighter color, and retain a greater degree of fluidity. Perhaps the bad smell of boiling oils and the great danger of their taking fire in the operation can be avoided by this treatment.

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ENGINEERING INVENTIONS.

A very ingenious car coupling is the subject of an invention recently patented by Mr. John C. Look, of Yuba City, Cal. The coupling is automatic in its operation, and is intended to prevent accidents which frequently occur to brakemen while coupling and uncoupling cars.

An improved cut-off mechanism for steam engines has been patented by Mr. James Thomas, of Catasauqua, Pa. This invention consists of a cylindrical valve combined with a slide valve, and operated by a governor which regulates the amount of steam passing through the slide valve to the engine. The means adopted for accomplishing the cut-off are very simple, and would appear to be effective.

An improved railroad switch, designed to prevent trains of cars from running off the track at misplaced switches, has been patented by Mr. William Spielman, of Oneonta, N. Y. The invention consists in connecting a lever attachment with the guard rails of a switch in such a manner that the wheels of the locomotive, in case the switch is misplaced, will actuate the lever mechanism so as to change the switch automatically, and enable the train to pass on without accident.

A novel hydropneumatic engine has been patented by Mr. Levi G. Cook, of Mapleville, R. I. This invention relates to a method of utilizing atmospheric air or gas under pressure, subject to percolation or passage up through a column of still water or quicksilver, to the driving of a series of submerged wheels, from which the power obtained may be transferred as required by any of the well known methods—gearing, belts, etc.

Letters patent have been granted to Mr. Baylus Cade, of Scott's Depot, W. Va., for an improved car coupling—an automatic car coupling, in which the pin is sustained by a tilting catch, which is removed from beneath the pin by the entrance of the link. The pin is made in the shape of a bifurcated bar sliding in vertical guides in the drawbar. This coupling is very simple in its construction, and appears to have less objectionable features than many patent car couplers and many more advantages.

A novel chair for railroad rails, designed to provide a rail chair that shall hold the rails firmly and solidly at the joints, and also allow the expansion and contraction of the rails, has been patented by Messrs. Charles Armstrong and George Abbott, of Galveston, Tex. The invention consists in the chair body and in straps of wrought iron which fit therein, for receiving the webs of the rail. One of the straps is fixed to the chair body, while the other is received in a recess in the chair, so that it may be inserted after the rail is set. A key passing through the two straps and chair body serves to keep the sliding strap in place.

An improved railroad signal of the following construction has been patented by Mr. Norman Allen, of Rockaway Beach, N. Y. The inventor proposes to pivot a number of signals upon posts at proper distances apart, and connecting these signals by a wire or rope, so that they may be set from one point for some distance to indicate danger. The signals are constructed with drums to which the actuating wire is attached, and likewise with reflectors and with projecting arms. When the rope or wire is drawn, the drums will be rotated on their pivots and the danger signals set, so that the reflectors will reflect the locomotive light by night, and the arms will be set at right angles to the track, by which means in foggy weather a torpedo placed on the extremity of the arm will be exploded by the passing locomotive.

MECHANICAL INVENTIONS.

An improved millstone driver has been patented by Mr. James F. Callahan, of Knoxville, Tenn. The object of the invention is to insure a steady and uniform rotation of the millstone and prevent any irregularities in the motor from affecting the movements of the millstone.

A new knob spindle fastening for mortise locks has been patented by Mr. Francis Lattimer, of Richmond, Nova Scotia. The special object of the invention is to facilitate the attachment of the knob to the spindle of mortise locks in a more secure manner than heretofore.

Messrs. E. L. Young and L. Dyer, of Millbridge, Me., have patented an axle lubricator which can be adapted to any kind of a vehicle. In using this device it is not necessary to remove the wheel in oiling, and it is arranged so as to retain the lubricant much longer than the common way.

Mr. W. P. Harmony, of Sidney, O., has recently patented a simple and convenient compositor's type case stand, so arranged as to enable its adjustment at any angle or height to suit the compositor, and when not in use can be so inclosed as to protect the type from dirt and dust.

A mechanism for converting reciprocating into rotary motion, designed especially for use in wind mills, has been patented by Mr. James D. Clarke, of Harvard, Ill. A swinging frame, carrying dogs or pawls, engages by the reciprocation of the frame with a recessed wheel, giving it a continuous rotary motion in a very simple manner.

Mr. J. A. Stephens, of Brockville, Ontario, Canada, has patented a novel and improved knife edging machine. It is intended for use in sharpening paper cutting and similar knives, requiring frequent, rapid, and very accurate edging. The machine is adjustable, so the angle of the blade can be altered at will, to accommodate itself to the grinding stone.

Mr. Conrad Muller, of Columbus, O., has patented a tool holder for lathes which seems to possess some advantages over the many lathe holders now in use. The adjusting screw and nuts, in their relation to the tool holding block, enable the tool to be accurately fed to the work. The nuts have a graduated scale collar, which insures the utmost accuracy in the adjustment.

A novel method of detaching life boats and buoys when lowered at sea has recently been patented by Messrs. Edward J. Hill and J. L. Clark, of Westminster, England. A float, preferably of cork, is lowered with the boat, and as soon as it reaches the water it automatically disengages the hooks, to which the line is attached which connects the life boat to the ship.

Mr. William A. Bradley, of Oshkosh, Wis., is the patentee of a new shingle sawing machine which embraces a number of changes and improvements over the old style of machine. A change in the driving gear, and in the bolt dogging and bolt setting apparatus, are the most important features of the improvement. The bolts in this machine are automatically shifted in a very simple manner, and reset for the successive cut.

A novel device for converting rotary into reciprocating motion, designed more especially for operating lift pumps by windmills, is the subject of a patent recently granted to Mr. C. M. Ford, of Bellevue, O. A novel arrangement of springs is attached to the vertical connecting rod, which counterbalances the action of the mill, and is intended to produce uniformity of its movement.

An improved derrick of simple and cheap construction has been patented by Mr. Patrick Kelly, of Poughkeepsie, N. Y. The derrick foot consists of a plate having upon its lower side a hollow pivot, and upon its upper side seats for the lower ends of the post and boom to rest in, whereby the post and boom will be securely held. The derrick post is secured to the foot by an eyebolt secured to the foot, and fastened to the post by a bolt.

An improved air separator and feeder for bolters, etc., has been patented by Mr. Robert Wilson, of Greenup, Ky. The invention consists in a tube through which the meal passes down and drops upon scattering wings by which it is scattered in the larger tube. The flour is carried upward and out through the outlet, by the current of air, and the meal drops into the bolter. The fan also draws all the hot air produced by the grinding stones from the bolter, so that the air in the same will be fresh and cool.

A very simple cotton press has been patented by Mr. William B. Ingram, of Lilesville, N. C. This press is worked by hand or other power. A pair of rock levers are located at the sides of the case to work the follower, the power being applied to them from a windlass by ropes working on segmental rims on the levers, maintaining uniformity of leverage, while the connection between the levers and the follower is such as to increase the leverage as the resistance increases.

A railroad switch lock has been patented by Messrs. Dan. P. Driscoll, of Pittsburg, Pa., and Joseph H. Dugan, of Dennison, O. In combination with a bolt is a rotary device which is rigidly mounted upon and actuated by a hollow spindle. An arm for locking the bolt is mounted upon a spindle arranged inside of the hollow spindle. The key is furnished with an outer and an inner part for engaging the spindles respectively and for imparting motion to the inner spindle an instant before the outer one is rotated, so as to disengage the locking arm before the bolt is withdrawn. In connection with this locking device, the ordinary switch lever may be employed.

A novel ore amalgamator has been patented by Mr. W. E. Harris, of New York city. The invention consists in the combination with a trough faced with amalgamated plates, and provided with inlet and outlet spouts and a slotted partition, of a longitudinal shaft revolving in the trough, and provided with amalgamated plates arranged at right angles to one another. A trough faced with amalgamated plates is provided with a shaft running the full length of the trough. To this shaft amalgamated stirring plates are attached as above, the same distance apart as the width of the plates. The revolving of the shaft stirs up and separates the contents.

An improved washing machine has been patented by Mr. August Scharnweber, of Davenport, Iowa. The invention consists in a tub of semi-cylindrical shape, provided with faucets, and of an upper and lower washboard or rubber. The clothes to be washed are placed between the lower and upper rubbers, and so connected that when the upper portion is oscillated by the handle in one direction, the other portion is oscillated in the opposite direction, and the clothes are thus thoroughly rubbed between the two rollers, and quickly cleaned without being worn or damaged. The upper rubber may be elevated to any height, according to the quantity of clothes to be washed, by means of a rod extending upward from it, and which operates telescopically within the handle which drives the rubbing devices.

An improved combined instrument for leveling, surveying, etc., has been patented by Mr. Rudolph Peter Gallis, of Hartford, Conn. The invention consists in devices for facilitating the determination of the direction, the setting, and erection of horizontal, vertical, and inclined lines of shafting, and of lines of shafting at right angles, or of geometrical lines in any of the above directions in general; also, for setting bases of machinery, parts of bridges, roofs, etc., in any of the above positions; also, for use in the work shop and other places as a common spirit level, as a right angled positive and negative square, as a straight edge, and as a face plate, and for similar purposes. This is an instrument designed especially for use in machine shops for determining in a more simple and accurate manner than heretofore the setting of bases of machinery, erection of lines of shafting, etc. It may be used also advantageously by bridge builders, and can be used as a right-angled positive and negative square; also as a spirit level, and for other purposes about machine shops and manufacturing establishments.

An improved cockle seed separator has been patented by Messrs. George Adams and Morgan M. Jenkins, of Sherburne, Minn. The invention consists of a machine furnished with an endless apron formed of a series of metal plates hinged one to the other, and furnished with numerous indentations. The grain is fed through a spout upon these plates between a brush having a rotary motion and the upper end of the frame, and which is thus spread out and rubbed during its passage by other brushes, having a motion contrary to the movement of the endless apron. This operation rubs and polishes the kernels of grain, and forces the cockle seed and other small seeds into the indentations of the plates, so that, while the grain falls from the lower end of the machine into a receiver, the cockle and other small seeds will be carried up by the plates, and will fall from the upper end of the machine. As the plates pass to the upper end of the machine, the rotary brush brushes back any kernels of grain that may be carried up by the plates, so that none of the grain will be carried up to the upper end of the machine, where the small seeds pass.

AGRICULTURAL INVENTIONS.

An improved method of irrigating agricultural and other lands has been patented by Mr. Moses A. Martindale, of Georgetown, Colo. A main pipe provided with valves at suitable intervals conducts the water from an elevated reservoir. Connected to the main pipe are smaller branch pipes, which distribute the water in small quantity over large surfaces. Upright pipes with sprinklers are also provided, so that lawns and gardens may be kept constantly showered where water is available. The principal object of this invention is, however, the irrigation of agricultural lands in regions where water is scarce, but can be obtained from adjacent mountains.

A wheel harrow of novel construction has been patented by Mr. C. F. Hornbeck, of Owego, N. Y. The machine has a rectangular frame with intermediate crossbars fitted for carrying the harrow teeth. The frame and its attachments may be swung up and down on pivots by means of arms which are attached to the frame, and operated by an adjusting lever. The teeth are constructed of flat bar iron or steel, which is left flat at the place where it is attached to the frame of the machine, but is twisted at its lower curved extremity, to form suitable teeth for the harrowing process. Teeth of this kind are very effective and may be made at small cost. Each of the teeth has a spring arranged to regulate its action in the ground.

A combined seed planter and cultivator of improved form has been patented by Mr. John J. Birdsong, of Medina, Tenn. A combined seed planter and cultivator is provided with plows. To the frame is attached a seed box, which is divided into two compartments by a slotted partition, and is provided with a discharge tube. To the sides of the seed box is journaled a seed dropping wheel, which is provided with inclined recesses to take seed from one compartment of the seed box and transfer it to the other compartment. A smoothing roller is connected with the frame by bars, which can be readily adjusted to regulate the tension of the driving belts and the depth to which the plows enter the ground.

MISCELLANEOUS INVENTIONS.

Mr. Alonzo H. Savage, of Ashtabula, O., has patented an improved button, to the back of which is affixed a wire shank provided with eyes, by which they are fastened to the garment.

An improved compass frame has been patented by Mr. R. A. Kipling, of Roselle, N. J., intended especially to be worn as a charm on a watch chain. By the construction of the compass frame, the needle pivot can be readily adjusted by unskilled hands.

A ditching spade of peculiar shape has been patented by Messrs. Elijah Kirkpatrick and Samuel Copron, of Gilbert's Mills, O. The spade is provided with two blades set at right angles to each other, or of a single blade bent in that form.

Mr. C. W. Hellenbrand, of Salem, Oregon, has patented a very simple improvement in the manufacture of candy, whereby he is enabled in a very simple and inexpensive manner to cut the molten candy into any fancy and ornamental forms desired.

Mr. George E. Stedman, of New York city, has patented a novel buckle, which is notable for its strength and simplicity of construction. It is intended principally for use in the interior of trunks and valises, where it is inconvenient to pass the straps through the frame of an ordinary buckle.

An improved paper box has been recently patented by Mr. W. H. H. Rogers, of Brooklyn, N. Y. The improvement relates to that description of paper boxes which is made by cutting a blank from paste board or any other suitable paper, so that when they are folded together, the flaps overlap the ends and sides of the box, giving it additional strength.

Mr. C. S. Barnard, of New York city, has recently patented a novelty in the way of a toy savings bank which is in the form of an elephant. The coin is placed on the end of the elephant's trunk, and by pressing a rod on his back or by raising the tail of the animal, the trunk is raised up and deposits the coin within the elephant, through a slot in its forehead.

Mr. Josiah P. Whitman, of Ithaca, Mich., has obtained a patent for an improved carriage top bow support. The invention consists in attaching to the back bow of carriage tops, at the points where they come upon lower joints of the frame, a protector or support at the middle, with a cushioned knob for supporting the top when lowered.

An ingenious blotter tablet has been patented by Mr. William Bancroft, of Wilmington, Del. The blotter tablet is made with guides at the upper corners of the tablet, and stop arms at the four corners of the blotter, to engage with the guides, and prevent the blotter from being separated from the tablet while allowing it to be readily slipped off and on.

Mrs. B. G. Borgesen, of Chicago, Ill., has recently patented a very neat and conveniently arranged work table for the use of ladies. It is fitted up with a number of trays and compartments for holding needles, embroideries, scissors, spools, and such other articles as ladies use in sewing, knitting, etc. The box makes a very compact and ornamental piece of furniture.

Mr. W. C. Seaton, of Quebec, Canada, has recently obtained a patent for a wick trimmer of simple construction. A spiral brush is revolved in a box into which the wick enters through a slot, and as the brush is revolved it removes the carbonized end of the wick in a very rapid manner without the hands of the operator coming in contact with either the lamp or the wick.

A cartridge implement has been patented by Mr. Edmund R. Darling, of Woonsocket, R. I. The instrument is adapted for capping, loading, and extracting cartridge shells, also for removing the caps from the shells; the whole thing being compact in form and adapted to be easily packed in the gun case or carried in the pocket, and will prove a very convenient tool for sportsmen.

An improved device for roughening grindstones is the subject of a patent recently granted to Mr. George Andrews, of Bellows Falls, Vt. The invention is especially intended for roughening the periphery of grindstones used in treating wood for making paper pulp. The implement is so set to the face of the grindstone as to peck it as the stone revolves, giving it a sharp, rough surface.

Mr. C. J. B. Gaume, of Brooklyn, N. Y., has received letters patent on an improvement in fishing tackle, which consists of a rod with a bell on the tip, which rings when a fish by a nibble causes the slightest tension of the line. There is also a spring attachment so contrived that when the fish takes a firm hold a lever is pulled, which relieves the spring to which the line is attached, thus automatically jerking the hook into the fish's mouth.

An improvement in the construction of jails, etc., designed to prevent the escape of prisoners, has been patented by Mr. Samuel M. McLean, of Modesto, Cal. It consists in lining the walls with a net work of pipes supplied by water under pressure, by which arrangement any attempt at cutting through the pipes to reach the wall would result in the flooding of the building, which would warn the guard of the attempt at escape of prisoners.

A flavoring extract for sirup and sugars, by which a maple sugar flavor is imparted, is the subject of a patent granted recently to Mr. Josiah Daily, of Madison, Ind. The inventor prepares a decoction from hickory bark or wood, which he mixes in small quantity with the saccharine matter. the decoction is strong, about three tablespoonfuls of it are required to a gallon of boiling sirup, to give it a fresh maple sirup flavor.

The ornamental piece of furniture called an ottoman has been improved, and a patent taken on the improvement, by Mr. William S. Wright, of Dover, N. J. The seat is mounted on a standard with ratchet, so that the height may be regulated to the will of the occupant. Underneath the seat, pockets are provided for holding sheet music, newspapers, etc. The construction of this ottoman is such as to render it adapted for a piano stool.

A very cheap, simple, and compact folding chair has been patented by Mr. George A. Leavitt, Jr., of New York city. The chair is made with a back having a hinged seat in front and a hinged prop to support the back, the seat and prop both folding up against opposite sides of the back when the chair is closed. By this construction, a very cheap chair is furnished, which is likewise portable, and occupies but little space when not in use.

An improvement in wooden horse collars for draught purposes is the subject of a patent granted to Mr. L. E. Woodard, of Owosso, Mich. The principal novelty of the invention lies in an arrangement for uniting the two sections of the collar, so that the coupling device is rendered interchangeable. The metallic couplings uniting the side pieces are provided with means for lengthening or shortening the strap for regulating the size of the collar.

Mr. G. W. Blake, of Port Townsend, Wash. Ter., has recently patented an improvement in buckles for belts and harness straps, which promises to be as useful as it is ingenious, being applied to straps without sewing or stitching, by the use of teeth in the socket of the buckle clamped by the jaws of a wedge. These buckles can be readily transferred from one strap to another, and their use saves much leather as well as expense in the construction of a harness.

A simple and inexpensive fire escape is the subject of a patent recently issued to Mr. John A. Edmonds, of Dover, Del. To the end of a wire or rope a hook is attached to be made fast to a window sill when required. Attached to the rope is a windlass, by which a person controls the speed of his descent from a building. The same appliance may be used equally well as an elevator for ascending to the upper story of buildings to rescue persons or property.

A dressmaker's measure for cutting dresses and articles of clothing has been patented by Mr. F. E. Buddington, of Stillwater, Minn. The invention consists in a measure for cutting dresses and other articles of clothing, constructed with cutters formed of bars, sheaths, and slides for drawing outlines of the back and front patterns, and a dart rule for drawing straight and curved lines. With this device the inventor claims that by taking the body measures carefully and adjusting the various parts of the measure accurately, a perfectly fitting dress will be produced.

A simple and cheap fire escape has been patented by Mr. Ray Howland, of Brooklyn, N. Y. A rope is connected with the window sill. With an eye formed in the shank of the friction hook is connected a rope or strap to be secured to the person escaping, and a cord to be passed around the hanging rope and through the shank eye of the hook for controlling the rapidity of descent. Upon the rope a friction hook of very simple construction is applied. Another rope is fastened to the eye of the hook, by which the person lowers himself, controlling the rapidity of his descent at will.

An improved gas light reflector has been patented by Mr. James S. Havens, of Ogdensburg, N. Y. The invention consists in arranging underneath the gas jet a cone made of polished metal, and having an open top and a convex glass bottom, by means of which the light is reflected downward in the room. Above the burner is arranged a large reflecting cone, which likewise reflects the light down into the room. This reflector being made of opal glass allows the light to pass through it and illuminate a stenciled band which is arranged around the rim of the reflector. This band, which supports the reflector, is suspended from a metal plate at the ceiling, and the lower reflector is hung upon chains which are suspended from the band mentioned.

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Business and Personal.

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The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

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Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

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Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 221.

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First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 222.

Lightning Screw Plates, Labor-saving Tools, p. 222.

The Best.—The Deuber Watch Case.

Curtis Pressure Regulator and Steam Trap. See p. 206.

The Sweetland Chuck. See illus. adv., p. 206.

Knives for Woodworking Machinery, Bookbinders, and Paper Mills. Taylor, Stiles & Co., Riegelsville, N. J.

The Celebrated Wooton Desk. See adv., page 206.

Comfort Dinner Pails.—Most convenient in use. For sale everywhere. Reardon, Ennis & Co., Troy, N. Y.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 190.

Scientific Books. See page 188. 100 page Catalogue free. E. & F. N. Spon, 44 Murray Street, N. Y.

Permanent Exposition.—Inventors' Institute, Cooper Union, N. Y. City. Every facility for exhibition of machinery, merchandise, and inventions. The expense is small—the advantages great. Send for particulars.

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Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

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Railway and Machine Shop Equipment.
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Engines, 10 to 50 horse power, complete, with governor, $250 to $550. Satisfaction guaranteed. More than seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

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Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

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NEW BOOKS AND PUBLICATIONS.

THE IMPERIAL DICTIONARY OF THE ENGLISH LANGUAGE. By John Ogilvie, LL.D. New edition, edited by Charles Annandale, M.A. Four vols., 4to. New York: The Century Company.

This important work, which has been accepted in Great Britain for more than a quarter of a century as a standard lexicon of the English language, and as one of the most useful works of the kind extant for general reference, is not merely an ordinary dictionary intended to supply philological information, but is, in addition, an encyclopedia, which gives brief, clear, and well summarized descriptions of things to which words are applied.

This encyclopedic feature adds greatly to the real usefulness of the work as a book of reference, and, along with the numerous quotations that it contains, makes it attractive reading. The scientific and technological features of the dictionary are closely allied with its encyclopedic character. While it does not contain, nor profess to, all the terms found in each art and science, yet it does contain far more than the reader will be likely to meet with in general literature. It is especially strong in the departments of botany, zoology, geology, anatomy, medicine, surgery, physics, mathematics, chemistry, mineralogy, astronomy, archæology, architecture, engineering, machinery, manufactures, agriculture, and commerce. In the treatment of subjects relating to science, the articles belonging to this department have, in order to secure accuracy, been submitted for revision to men eminent for their scientific attainments. Wherever an engraving can help to set the meaning of a word more clearly before the reader, it has been introduced; and these engravings, which number nearly three thousand, have been executed with remarkable care and finish, and are splendid specimens of the wood engraver's art.

This new edition of the Imperial Dictionary, which is here offered to the public by the American publishers, without change or revision, has been in preparation for over ten years, and so greatly has the vocabulary been increased, and so important and extensive have been the changes due to the revision, that it may now be considered a *new work*.

The separate words or entries contained in the four volumes before us number about 130,000, the definitions in all the cases that we have examined being specially full, clear, accurate, and concise. The etymology in this new edition has been altogether remodeled and brought up to the present state of knowledge on the subject, and special care has been taken to state in a concise form such facts regarding the derivation of each word as might suffice to meet the wants of the general reader, without entering into an extended treatment that could be appreciated only by the philologist.

Altogether, this work forms a wonderful monument of wide research and erudition, and should find a place on the book shelves of all classes of readers.

REPORT OF THE ENTOMOLOGIST OF THE DEPARTMENT OF AGRICULTURE, Charles V. Riley, M.A., Ph.D., for 1882. Author's edition. Washington: Government Print.

Contains a partial summary of the year's correspondence and labor of the entomological division in the promotion of silk culture; a report on pyrethrum, its use as an insecticide, its cultivation in the United States, and experiments made in its use; study of the chinch bug, the army worm, the scale insects of the orange, rice insects, corn and clover pests, the cotton worm, the apple maggot, new lac and wax insects, etc. The report is well indexed and illustrated. In view of the circumstance that the aggregate annual loss to the nation from insect depredation amounts to many million dollars—Prof. Riley says hundreds of millions—it is a pity that means are not provided for the fuller reporting of the work of the entomological department. The work is so well done and so useful that it should not be stinted in its publication.

COTTON AND WOOLEN MILLS OF EUROPE. Reports of U. S. Consuls in answer to a circular from the Department of State. Washington: Government Print. Sept., 1882. 8vo., paper, pp. 400.

Comprises about forty reports upon the cotton and woolen industries of the principal European trade centers, each report describing minutely the mechanical, financial, commercial, and labor conditions under which the manufacture is carried on, with all kindred information obtainable. It is needless to add that the information given is of great value to manufacturers and dealers, as well as to legislators and all interested in the real and relative welfare of American operatives.

TEXT BOOK OF GEOLOGY. By Archibald Geikie, LL.D., F.R.S., Director General of the British Geological Surveys. London: Macmillan & Company.

This admirable text book is an expansion of the article "Geology" in the revised edition of the Encyclopedia Britannica. Dr. Geikie is a charming writer, a master teacher of his favorite science, and also one of its most successful prosecutors. He has been a close and appreciative student of American geology, in the field as well as in the reports of our working geologists, and in his breadth of view and grasp of his subject he shows a marked advance upon the views of the rigid uniformitarian school which has so long dominated English geology. To American students his work possesses peculiar value from the fact that, unlike our popular American text books, which dwell most upon historical geology, it is particularly full in its treatment of the cosmical aspects of geology, rock structure, and dynamical geology. The seven divisions of the work are: Book I. Cosmical Aspects of Geology, 24 pages. II. Geognosy, an investigation of the materials of the earth's substance, 162 pages. III. Dynamical geology, a study of the agencies of geological changes, their operations and effects, 276 pages. IV. Structural geology, 125 pages. V. Paleontological geology, 304 pages. And VI. Physiographical geology, 19 pages. The illustrations are carefully selected and include a large number from De La Beche's classical "Geological Observer." The work has a copious index.

THE BREWER, DISTILLER, AND WINE MANUFACTURER. Philadelphia: P. Blakiston, Son & Company. $1.75.

This is the first of a series of English technological handbooks to be edited by Mr. John Gardner. It gives directions for the manufacture of beers, spirits, wines, liquors, etc., as carried on in England. Its value for this market would be materially enhanced by the addition of chapters on the treatment of American wines, and the brewing of larger beer.

THE SLIDE RULE SIMPLIFIED, EXPLAINED, AND ILLUSTRATED. By Robert Riddell. Philadelphia: J. B. Lippincott & Company.

The author's aim is to demonstrate the practical scope and utility of the slide rule as a means of mechanical calculation, and to illustrate its capabilities and use in connection with the work of the carpenter and joiner. Skillfully handled the slide rule is a wonderful saver of time and labor, a pocket calculating machine, which every mechanic should know how to take advantage of. Mr. Riddell's illustrations are abundant and well chosen. The preliminary explanations might be clearer, but any intelligent boy or man can master their meaning with proper study, rule in hand, and will be sure to find the lesson a useful one.

THE MATERIALS OF ENGINEERING In three parts. Part I. Non-metallic materials. By Robert H. Thurston, C. E. New York: John Wiley & Sons.

Prof. Thurston has here brought together a considerable amount of practical information with respect to stones and cements, timber, fuels, lubricants, and minor non-metallic materials used by engineers, such as leather, paper, rubber, cordage, etc. The adaptation of different materials to special uses, their varying strength and durability, modes of testing and of preservation, their uses, economical characteristics, and behavior under ordinary conditions are discussed at some length. An appendix embraces a large number of handy conversion tables, a report on the centimeter, gramme, second system of units, with conversion tables, and a table of four figure logarithms.

REPORT UPON THE PRIMARY TRIANGULATION OF THE UNITED STATES LAKE SURVEY. By Lieut. Col. C. B. Comstock. Washington: Government Print.

Contains nothing of popular interest. There are elaborate discussions of standards of length, basis, and base apparatus; of the testing and use of such standards and apparatus; illustrations of the methods of conducting triangulations; and descriptions of the methods and instruments of astronomical work, and kindred matters, which will be appreciated by those engaged in work of this nature, and possibly by students of geographical surveying.

ANNUAL REPORT OF THE CHIEF SIGNAL OFFICER FOR 1880. Washington: Government Print.

A volume of portentous size, in which the useful information given—which is considerable—is buried out of sight and almost past finding. Brief digests and summaries of the results of observation and experience would cost less and would be much more serviceable to the public.

SAW FILING. By Robert Grimshaw. New York: John Wiley & Sons.

In addition to saw filing the little book treats of the structure of saw teeth, the choice of saws, gumming, spring setting, and swaging. It is amply illustrated and seems likely to be of use to practical sawyers.

THE COLORS OF FLOWERS AS ILLUSTRATED IN THE BRITISH FLORA. By Grant Allen. London: Macmillan & Co. $1.

Mr. Grant Allen needs no introduction to the readers of this paper. He has a rare faculty both for original investigation and for describing his observations entertainingly without sacrifice of scientific quality. This, the latest addition to the "Nature Series," comprises five essays treating of the origin of petals in flowers, the law of progressive coloration, variegation, temporary or permanent reversion of color, degeneration, and other phenomena illustrating the natural variations of flowers, and the bearing of such variations upon the theory of evolution.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) C. M. S. asks: 1. In electric telephoning, is the voice or sound actually transmitted, or is it reproduced? A. It is reproduced. 2. In electric telegraphing, does the electricity pass from one point to another—say, from Boston to New York—and do its work, or is it an electric disturbance (if that is the way to put it), not unlike the disturbance of the air in a room, when on opening one door another is closed, not from the air at the opened door rushing over and closing it, but by the movement of the whole body of air in the room? A. For the sake of convenience, dynamic electricity is usually spoken of as flowing in a current along its conductor. No one knows the nature of the action of electricity.

(2) H. W.: For soldering flux use borax glass; pulverize, and then add water to proper consistency.

(3) A. M. F. asks: 1. Can absolute alcohol be frozen, and if so, at what temperature? A. Alcohol has never been solidified. 2. Can the spirit used in thermometers freeze, and if so, at about what temperature; and what is used to measure a very low temperature? A. Alcohol thermometers are used for low temperatures. 3. What kind of thermometers does the United States Signal Service use for low temperatures, below the freezing point of mercury, and are there any better made? A. See SUPPLEMENT, No. 59, for the general subject of thermometers. We presume the United States Signal Service uses alcohol thermometers for very low temperatures. SUPPLEMENT, No. 209, describes the instruments used at the New York Meteorological Observatory.

(4) F. E. W. asks: 1. What is the chemical composition of ordinary "laughing gas" as used by dentists? Can it be described as "ordinary air with an excess of oxygen"? A. Laughing gas is nitrogen monoxide (N_2O). The name you apply would be incorrect. 2. What is the composition of prussic acid, and what is its action upon the system, by reason of which it causes almost instant death? A. Prussic acid is chemically hydrocyanic acid (HCN), one atom of hydrogen combined with one atom of cyanogen. It produces coma by acting on the nerves of motion or sensation. A very full description of its symptoms may be found in Taylor's "Medical Jurisprudence."

(5) E. B. asks: What is the exact analysis of sulphate of potash, and where and how is it produced? Also, what crops are designated as field crops, and what as garden crops? A. Potassium sulphate is a by-product from several chemical industries. It is also made directly as a fertilizer by several large dealers. Frequently it is sold commercially as pure as 85 per cent of potassium sulphate. The field crops are wheat and such products, while vegetables, etc., are called garden crops. The following are analyses of potassium sulphate as manufactured by one of our large fertilizer companies:

	1. Per cent.	2. Per cent.
Potassium oxide	36·11	32·34
Sodium oxide	8·50	7·31
Sulphuric acid	49·82	44·78
Moisture list at 100° C	0·86	0·25
Insoluble matter	1·06	0·74

(6) H. T. Co. ask: What is the best preparation or lubricant for wooden cogs in heavy gearing? A. Black lead and tallow.

(7) J. W. S. asks: 1. Is the light of a lamp affected by the color of a ceiling? A. A room having white walls and ceiling will be better illuminated by a lamp than a room with colored walls and ceilings. White walls reflect a great proportion of the light, while dark walls absorb it more or less, according to the depth of color. Of course the amount of light produced by the lamp is unaffected by its surroundings. 2. What can I use to remove mildew from a cement wall? A. Mildew on walls may be partially removed by scrubbing with soda water, and when dry whitewash or paint. A solution of oxalic acid may be used as a wash to bleach out the stains after the scrubbing. 3. Will a live fish add anything to the weight of a bucket of water? A. The fish will add its own weight to the bucket of water.

(8) E. F. F.: A locomotive cannot get on a dead center unless the engine of one side is broken down, and it is running with only one engine.

(9) J. S. asks how to calculate the change-gears for a screw cutting foot lathe to cut any number of threads per inch; the lead screw has ten threads per inch. Please give full instructions. Also, when cutting threads on a foot lathe, when you have gone over the thread once and want to go over it again, do you have to back the tool out of the cut and reverse the foot wheel and run it backward until the tool is where it began, and then begin another cut? A. The gearing and management for cutting threads are the same in principle upon all lathes. In SCIENTIFIC AMERICAN, "Notes and Queries," vol. xlvi., query 31, page 323, you will find formulas for two styles of gear. If your lathe has a *clamp* grip upon the leading screw, you can unclamp and slide back for any number of threads that will divide by 10 without a remainder, or that is a divisor of 10 without a remainder, thus in your case you can slide back for 2½, 5, 10, 20, 30 threads to the inch only, and will have to run back for all others.

(10) R. W. S.: The charge of powder for a 100 ton gun is 452 to 450 lb., pebble powder.

(11) W. J. R. asks how to transfer a print (common printing) to a piece of polished steel. A. To transfer prints to polished steel, or to glass, make a varnish as follows: Gum sandarac, 4 ounces; mastic, 1 ounce; Venice turpentine, 1 ounce; alcohol, 15 ounces; or any smaller quantity in proportion. Digest in a bottle, with frequent shaking. Moisten the print slightly upon the back by laying a wet cloth upon it; then varnish the steel plate or glass with a thin even coat; lay the print with the face next to the varnish, commencing on one side so as not to inclose air bubbles, pressing it down close with the fingers if the print is small, or a soft roller if the print is large. Be careful that all parts of the print are in contact with the varnish. Lay aside to dry. After it is dry, wet the back with water and cautiously rub the paper off with the fingers; rub lightly toward the last with plenty of water, and the surface of the varnish will come up smooth with the ink of the print solidly embedded. Then a thin coat of mastic varnish will give it a finish.

(12) T. D.: To cut glass water gauge tubes, file a nick in one side and break as you would a stick. In some cases it is necessary to scratch the tube on the inside. You can do this with the sharp end of a broken file.

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(13) A. F. S. asks how to prepare a good blacking for the interior of telescope tubes. I am about to construct one, and would be very much obliged to you for this information. A. For dead black for inside of telescope tubes use alcoholic shellac varnish and lampblack, equal parts by weight, and thin with enough alcohol to make it flow freely with the brush.

(14) J. L. B.: The method of preparing paraffine paper is as follows: Dissolve paraffine in benzine, and into the warm solution dip the paper, sheet by sheet; let drip off and dry. On the large scale it may be done by letting paper from a continuous roll pass through such a solution, and then between flannel to absorb the surplus. Wax is best dissolved in carbon disulphide, and paper can thus be made ready for use in five minutes. Quite a good plan is to apply the benzine solution of paraffine by means of a sponge.

(15) S. L. asks if there is any chemical or mechanical means for repolishing glass after being scratched? A. Slight scratches may be partially polished out by rubbing the part with rouge wet with water upon a piece of soft leather. If it is a deep scratch, it will have to be ground out with the finest flour emery, such as is used by opticians, and the spot polished with rouge and water upon a piece of soft leather. If you have much of this kind of work to do, it will save time to set up a buff wheel made of wood, and grind out the scratches with fine pumice stone and water. Then polish with a felt buff and rouge with water.

(16) A. S. M. asks: Do locomotives ever work up to 100,000 horse power on the road? A. No. What is the highest power ever developed by locomotives? A. About 800 horse power.

(17) J. E. asks: 1. For a test for determining the presence of sulphuric acid in a liquid? A. Barium chloride gives a white precipitate with sulphuric acid. 2. Is there any other chemical that will change starch into sugar? A. Any dilute acid.

(18) F. asks: The best cement for small pieces of ore on wood or metallic substances; have tried glue and whiting mixed.

A. Starch ..... 2 drachms.
White sugar ..... 1 ounce.
Gum arabic ..... 2 drachms.
Water ..... q. s.

Dissolve the gum, add the sugar, and boil until the starch is cooked.

(19) A. L. H. asks what the composition used in common friction matches is.

A. Fine glue ..... 2 parts.
Water ..... 4 "
Phosphorus ..... 1½ to 2 "
Potassium chlorate ..... 4 to 5 "
Powdered glass ..... 3 to 4 "
Red or white lead or smalt sufficient to color.

For complete information consult Dussauce, Practical Treatise on the Fabrication of Matches, etc. SUPPLEMENT No. 84 contains a good account.

(20) G. A. B. asks: Is there not a method of hardening and tempering shears and scissors (both solid steel and steel laid blades) in water without their water cracking or becoming too hard to work, which is preferable to hardening and tempering in oil? If so, please give directions for doing same. If, in your judgment, oil is best, please give the best mode of using it. Is there anything better than oil or water for the purpose? If so, what and how used? A. Shears, if made of low steel, such as shear or double shear or even of American spring steel, should not water crack if properly treated. We fear that you heat them too hot and throw them into the water in any way most convenient. There is probably no better way than, first, to test the hardening quality of the steel by a few trials of the lowest heat that it will harden in water at 70°, or shop temperature. Be careful not to overheat the points, and dip vertically. Oil is preferred by some because it does not chill the steel so quickly as water. If you would like to try the oil hardening, the process is the same as with water, with the same precautions. Use only the best lard oil. If you are making shears and scissors from fine steel, you will probably find all the difficulty in overheating, as fine steel will not stand *high heat hardening.*

(21) J. H. F. asks: 1. Does the steam pressure on a piston head keep up to a given pressure as the piston recedes, or does it diminish gradually? A. The pressure remains the same if the opening to the cylinder be large enough; but if too small, the pressure will fall. 2. State the differences in a large cylinder and a short crank and a small cylinder and a long crank—that is, as to the comparative power obtained. A. Theoretically there is no difference; practically, the friction would probably be most with large cylinder and short crank.

(22) C. C. writes: In your paper of the 13th ultimo, answering query 41, a receipt is given for waterproofing linen garments. Would the same ingredients and application thereof do for worsted and woolen garments without damaging the texture and color? Or in case you know of a superior receipt, would you oblige by placing it in your columns? Would you please answer: 1. After boiling for a quarter of an hour, you say *rinse* out. 2. After being in the solution for 6 hours, wring out and *wash.* Should the rinsing and washing process take place in cold or hot water? A. The following may be tried. Two solutions are prepared. The first, composed of 1 part dry gelatine dissolved in 4 parts of oil, contains a little sulphuric acid. The substances are mingled by the aid of heat, after which about 5 parts of an alkaline solution, 26° B. strong, is added and stirred till cold. To prepare the second solution, dissolve alum, zinc sulphate, and lead acetate in three separate vessels, making each solution of the same degree of density. Mix these in the proportions of 5 parts alum solution, 1½ parts zinc solution, 5¼ parts lead solution. After settling, the supernatant liquid is diluted to 1° to 2° B. Textile fabrics are first treated in a bath containing ½ fluid ounce of the first solution in 9 quarts of hot water; after draining and drying they are left 8 to 12 hours in the second solution, and gradually dried, which finishes the process. See also SUPPLEMENT, No. 317.

(23) T. A. C. asks: 1. Is the tendency of the time to use high speed engines for increase of power? A. Yes. 2. Will an engine with a driving wheel 3 feet in diameter, running at 300 revolutions per minute, exert more power on the line shaft than an engine of driving wheel of 6 feet diameter making 150 revolutions per minute? A. Yes, because the pressure on the piston is expended on an arm or radius of 1½ feet in the first case and 3 feet in the last. Assuming the pressure on the piston to be the same, the power given out is in proportion to the speed.

(24) J. C. G. asks: What process may be used to the best advantage in coloring meerschaum pipes? If a meerschaum pipe is once burnt, can it be remedied so as to continue coloring afterward? A. When once burnt the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschaum is prepared. The coloring is produced by action of the smoke upon the oils and wax which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

(25) W. H. W. asks: 1. Where can I get selenium, what it costs, and if it would make a good electric conductor? A. Selenium can be purchased in New York of almost any of the dealers in pure chemicals. Its cost is about $4.00 per ounce. Its conductivity varies according to the degree of light or heat to which it is exposed, and it conducts electricity better at a higher temperature than at a low temperature. 2. Can white cast iron be magnetized, and how? A. White cast iron can be magnetized if chilled or hardened. It may be charged with an electro-magnet.

(26) C. F. P. asks for a recipe for making shellac varnish that will be a good insulator of electricity. A. Dissolve the best orange shellac in 95 per cent alcohol.

(27) D. S. asks: What can I put on canvas to make it airtight and flexible? A. Boiled linseed oil is generally used for the purpose indicated. In time the oil will take up oxygen from the air, and in that condition it has a rotting effect upon the fabric.

(28) E. M. G. writes: I would like to have some information on "spongy iron," and how made, if you can give any. A. Pure iron may be obtained by heating pure ferric oxide in a current of hydrogen gas. At a strong red heat the metal is obtained in a spongy state. Spongy iron, such as is used for filtering purposes, is simply metallic iron.

(29) A. B. writes: 1. "To lime whitewash add sulphate of zinc." Is this of any value, and if so, how much zinc must I add? A. Zinc sulphate is added to the lime whitewash to prevent it from souring. It acts as an antiseptic. Less than one per cent should be added. 2. Can ice cream be prepared without eggs and without heating? If so, how? A. Ice cream can be made without eggs by using gelatine, but not without heat, as we know of.

(30) G. L. asks: 1. What article contains the largest amount of butyric acid? A. Butyric acid is found in butter and in various animal and vegetable fats. 2. Can you give me a recipe for preserving eggs for five or six months—a cheap and effective one? A. Consult SCIENTIFIC AMERICAN SUPPLEMENT, No. 317.

(31) G. H. B. asks: 1. What is the process of the manufacture of vaseline? A. Vaseline is obtained by distilling off the lighter and more volatile portions from American petroleum, and purifying and decolorizing the residue by treatment with sulphuric and potassium bichromate and subsequent digestion with animal charcoal. 2. The process of deodorizing alcohol. A. To deodorize alcohol the following is recommended: To each gallon add an aqueous solution of four to eight grains potassium permanganate, shake well, and add, after five minutes, as much calcium chloride, previously rubbed with a little water. Filter the liquor after several hours, and set it aside for a few days. The alcohol will then have lost its chlorine smell and acquired a peculiar flavor, which, however, depends on the proportions of the permanganate and calcium chloride used. If then distilled, the alcohol may be used as the finest cologne spirit.

(32) C. E. H. writes: I wish to do some brazing, and for this purpose I constructed a fire-pot 8 inches in diameter and lined with fire-brick. This is filled with charcoal and attached to a small blower, in imitation of those used with a portable forge. The parts to be soldered are filed clean and placed in position. The solder is then applied, and borax is used as a flux. The fire is raised to its highest temperature we can obtain before the soldering is attempted; but the difficulty encountered is that the copper pipe which we wish to unite will become red hot and all the flux apparently burnt off without melting the solder, or, at least, melt it very imperfectly. What is wrong, and how can I overcome the difficulty? A. You cannot braze copper pipe with the seam side *up* without difficulty. The proper way is to clean the edges and wire the pipe with small iron wire at small intervals to keep the edges together. Then brush a borax solution, made by rubbing a piece of borax upon a stone with water, upon the outside along the seam, and also upon the inside if the tube is not long. Then place a few pieces of low or common yellow brass upon the inside along the seam, dipping the pieces into the borax solution before putting them in place. Put one piece close to the end that you begin to heat first. Arrange the fire (which should be charcoal) so that you can incline the tube about twenty degrees. Lay the tube into the fire, *seam down* so as to melt the brass at the upper end first. As soon as the brass begins to flow, gradually draw the tube toward you, looking at the progress of the flow upon the inside, until the brass has flown through the whole length of the seam. If upon examination it is found perfect, take off the wires and boil the tube in a pickle made of one part sulphuric acid to ten parts water, in a copper dish; or, if not convenient, heat the tube nearly red and plunge in the pickle. If places are found not perfect, push a piece of brass and borax solution to the proper place inside and heat as before. Spelter solder that is granulated is made for such uses, and is furnished by most houses that deal in sheet brass and copper, or can be procured at a coppersmith's. A piece of sheet brass, cleaned and clipped with shears, should make good work.

COMMUNICATIONS RECEIVED.

A Challenge for Scientific Men. By H. C.
Electricity in Gold Mining. By O. H. T.
On Sewage. By S. G. J.
On Storms. By A. W.
On the Protecting Qualities of Snow. By E. G.A.
On Cleopatra's Needle. By T. H. H.
On the Siemens Dynamo. By M.
On the Cause of the Aurora. On the Cause of Earthquakes. By W. H. W.
On Aerial Navigation. By F. B.
On the Hydrostatic Paradox. By F. S. H.
On the Vienna Electric Exhibition. By A. P. De R.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 27, 1883,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

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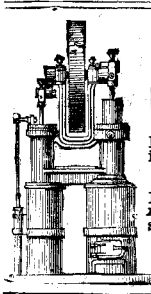

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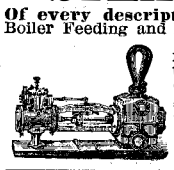
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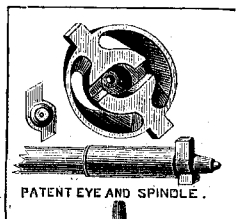

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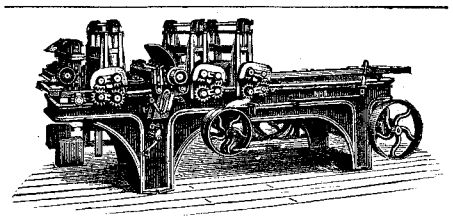

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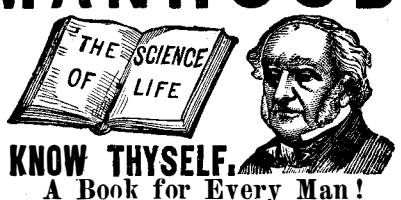

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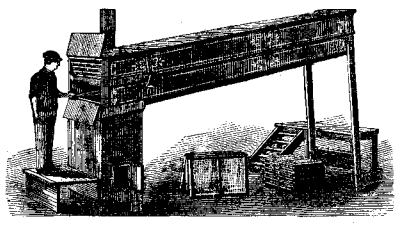

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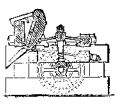

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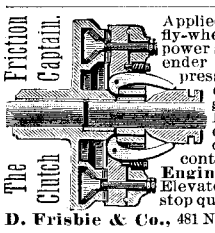

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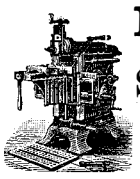

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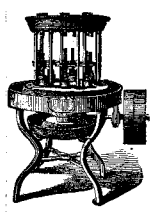

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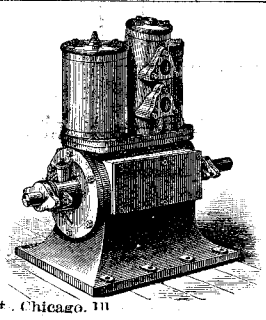

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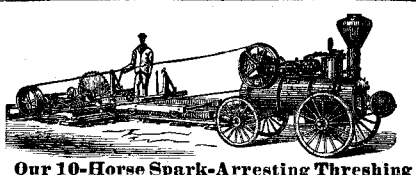

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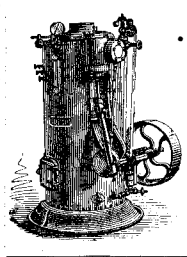

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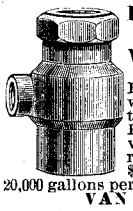

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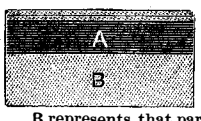

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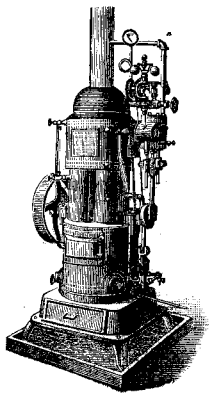

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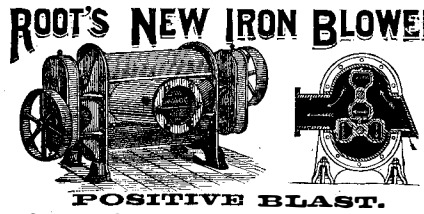

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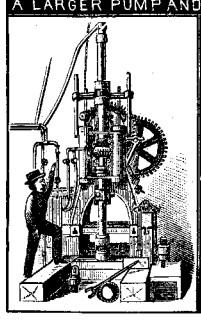

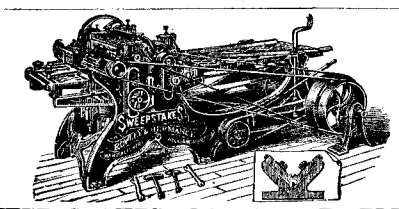

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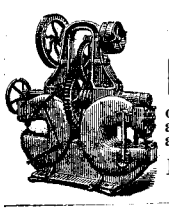

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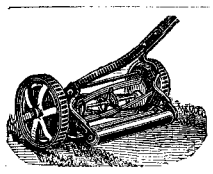

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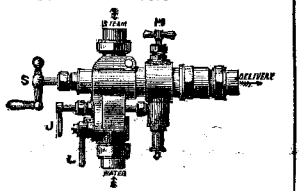

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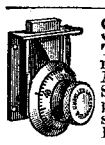

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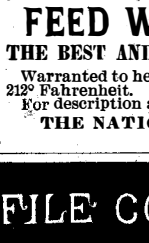

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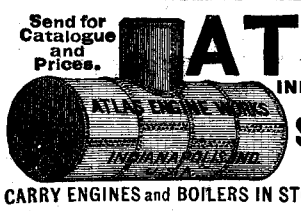

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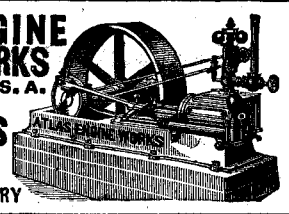

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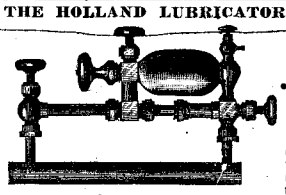

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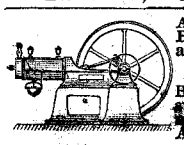

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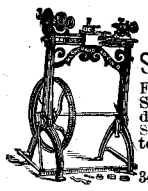

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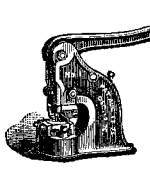

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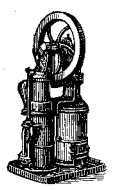

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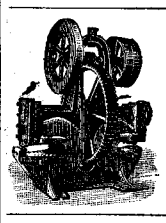

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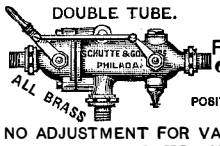

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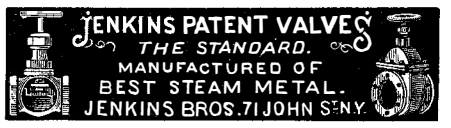

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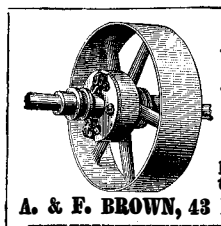

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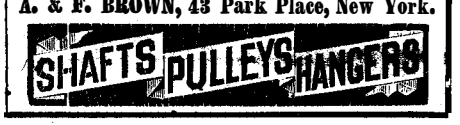

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